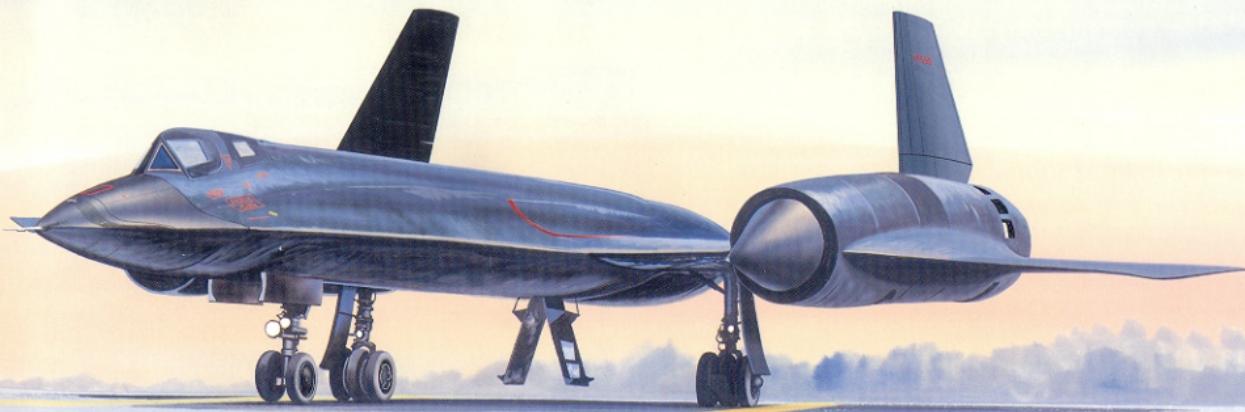


Walk Around

SR-71 Blackbird



Don Greer



Walk Around Number 32
squadron/signal publications

Walk Around

SR-71 Blackbird

By James Goodall

Color by Don Greer

Illustrated by David Gebhardt and Darren Glenn



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Introduction

Early in the Cold War, the Central Intelligence Agency (CIA) needed a reliable way to monitor developments within the Soviet Union. The solution was the Lockheed U-2. First flown in August of 1955, the U-2 was considered a short-term solution. Lockheed designer Kelly Johnson and other influential CIA members were convinced that its life span would be limited and a successor would be necessary to replace the 'Dragon Lady,' even before her first flight.

That requirement led to the A-12 and follow on Blackbirds – the YF-12 and SR-71. A CIA study made it apparent that the easiest way to overcome the U-2's shortcomings was to design a totally new, all-new aircraft platform that could remain immune to the ever-increasing threats from Soviet anti-aircraft fire and Surface-to-Air Missiles (SAMs).

CIA and Lockheed studies made of current and future threats associated with overflights of the Soviet Union identified the basic requirements for what became the A-12. The study stated a speed of Mach 3 to Mach 4, with altitude over target to be between 80,000 to 100,000 feet (24,384 to 30,480 m). Meeting these requirements called for employing the latest technology that money could buy. The U-2's replacement needed a minimal Radar Cross Section (RCS), leading edge Electronic Countermeasures/Defenses (ECM/DEF), designed-from-scratch advanced cameras, film systems, and other sensors, all with the ability to communicate and navigate where only rocket-powered flight had previously taken place. These requirements were laid down in 1954 – only seven years since Chuck Yeager broke the sound barrier in the rocket-powered X-1! Man was going where man had not been before, Mach 3.2 (2377 MPH/3825 KM/H) at above 80,000 feet!

With that humble beginning, the Blackbird symbolized just what the Lockheed Skunk Works – under the guiding hand, direction, inspiration and brilliance of Kelly Johnson and his hand-picked team of engineers and aircraft builders – were capable of. In just 27 short months, Kelly took his design from the drawing board to first flight. That is how history is made.

The most ironic twist in the creation of the U-2-replacement is that the 'Dragon Lady' still flies today and will for many years to come. The Blackbird is relegated to the two remaining flyable SR-71s at the National Aeronautics and Space Administration (NASA) and the remaining airframes on public display at museums throughout the US.

Dedication:

This book is dedicated to my dearest and closest friend, the late John Andrews, brought together through a common love of the Blackbird and other Skunk Works wonders. John Andrews is known by most in the modeling industry as "Mr. Testors" and lovingly called "that Son of a Bitch from Testors" by the late Ben R. Rich, former President of the Skunk Works.

In loving memory of
John Andrews
August 9, 1932 – April 2, 1999

Acknowledgments

To everyone that has ever shared my love of the Blackbird. The men and women that built, maintained and flew her, the hundreds of thousands that have watched in awe as one of these masterpieces from Kelly's Skunk Works flew by at an air show or was placed on static display for all to wonder. To my very first encounter with the Blackbird on 10 March 1964 at Edwards Air Force Base (AFB), California. And to everyone that has ever helped me accumulate my vast library of photos and information on this incredible flying machine, thank you!

John Andrews	Tony Landis	Marty Isham
Ben R. Rich	Lou Schalk	Jim Eastham
Bob Gilliland	Buddy L. Brown	Bill Fox
Ken Collins	Denny Sullivan	Jack Layton
Mele Vojvodich	Frank Murray	Hugh Smart
Ray Schruggenost	Roger Andersen	The Black Z-man
Dave Prusseil	Lanny Jenkins	Dave Liss
Arne Anderson	Jay Miller	Dave Menard
Charles B. Mayer	Brian C. Rogers	Rich Roth
Bill Sweetman	Leiford Haynes	Mike Quan
Tom Pugh	Don Fennings	Art Haines
Pete Haines	Ken Hurley	Jesse Lozano
Dave Allison	Mike Zervos	Ron Carpenter

To the men and women of the 112th Special Activities Squadron (SAS), the members of the Area 51 flight test team, YF-12/SR-71 Flight Test and CAT I & CAT II Test Force at Edwards AFB and Air Force Plant 42, Site 2, Palmdale, California that flight tested her, fixed her, kept her clean and ready for action, and to those that have gone on to a better place.

My very beautiful and loving wife, Nora Diane Goodall, the best proof reader and editor I could ever dream of working with, without her dedication and help on this book it would never have happened.

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(Front Cover) An SR-71A (61-7980) assigned to Detachment (Det) 4, 9th Strategic Reconnaissance Wing (SRW) sits on the ramp at Royal Air Force Base Mildenhall, England. This Blackbird flew a Bomb Damage Assessment (BDA) mission over Libya after the US air strikes (Operation EL DORADO CANYON) on 15 April 1986.

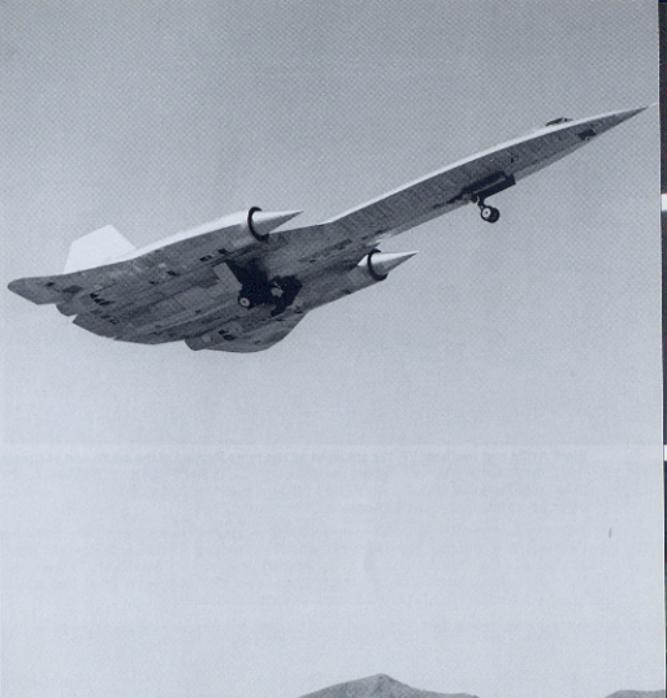
(Previous Page) An A-12 (number 130/60-6933) appears in its original natural metal and Black paint scheme in early 1963. The A-12 flight test and operational hangars were located at the south end of the 'Area 51' facility in Nevada and have subsequently been used for HAVE BLUE flight testing as well as the first home for the Lockheed F-117As prior to being reassigned to Tonopah Test Range, Nevada. (Author's Collection)

(Back Cover) Sporting the Lockheed Skunk Works insignia on the tail, this SR-71A (61-7955) flies a high altitude test mission in the 1970s. The Air Force Logistics Command operated this Blackbird from Air Force Plant 42 in Palmdale, California.



The final A-12 (Lockheed number 133/serial number 60-6939) is on the Blackbird final assembly line at the Lockheed Skunk Works, building 309/310, in Burbank, California. This aircraft was delivered by road to the test site at Groom Dry Lake, Nevada (aka 'Area 51' or 'The Ranch') in early 1964. Aircraft 133/939 was lost in a landing accident on 9 July 1964 on its tenth flight, after logging 8.19 total flight hours. Lockheed built 13 A-12s – including one two-seat trainer – for the Central Intelligence Agency (CIA), which assigned this aircraft the project code name OXCART. (Author's Collection)

Both wings are raised on the second A-12 built (122/60-6925) at Burbank. This feature permitted access to the Blackbird's Pratt & Whitney J58 engines and was also employed on the later YF-12 and SR-71 aircraft. A-12 number 122/925 is now displayed at the USS INTREPID Museum along the waterfront in New York City, New York. (Author's Collection)



Lockheed Chief Test Pilot Lou Schalk flew the initial A-12 (121, 60-6924) when it made its first official flight from 'Area 51,' Nevada on 30 April 1962. (It made an unofficial test hop four days before.) Its landing gear retracts into the airframe while the aircraft climbs after take off at 170 knots (196 MPH/315 KMH). This A-12 did not use the composite panels on the chine, inlet cone, rudders, or lead/trailing edge of the wing and elevons. These materials were used on subsequent versions of the A-12 and the follow-on SR-71. The entire exterior was completely fabricated with titanium. Groom Dry Lake is located approximately 100 miles (161 km) northwest of Las Vegas and its flight test facilities were originally built for testing Lockheed's U-2 in the mid-1950s. (Author's Collection)



Eight A-12s and two later YF-12s are lined on the ramp located at the south end of Groom Dry Lake, Nevada. The tail numbers are (front to back) A-12s 06924, 06927, 06928, 06929, 06930, 06931, 06932, 06933, and YF-12s 06934 and 06935. Red ring-shaped covers are placed over the engine inlets. (Author's Collection)

The first successful in-flight air-to-air refueling of an A-12 occurred in early 1963. Jim Eastham flew aircraft 121 (60-6924) when it connected with a Boeing KC-135Q Stratotanker (58-0054). The US Air Force assigned this short-tailed KC-135Q to 'Area 51' for A-12 testing. Special tanks for the Blackbird's JP-7 fuel were fitted into the 56 KC-135As modified to KC-135Q standard. (Author's Collection)

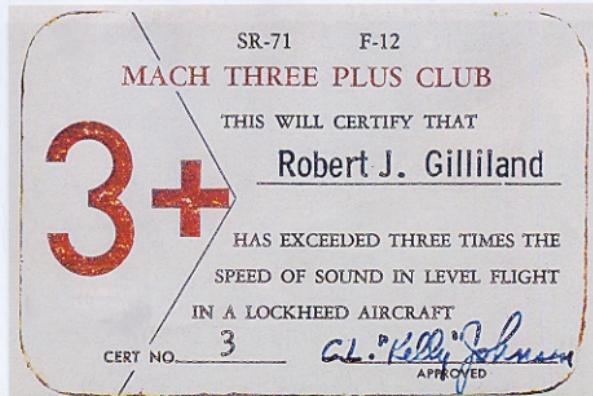


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This image of the ninth A-12 (129/60-6932) was one of the earliest A-12 photos the CIA released during the summer of 1982. This aircraft – in an all black (FS37038) 'Iron Ball' paint scheme with natural metal rudders – flies over cloud covered 'Area 51'. The aircraft and its CIA pilot, Jack Weeks, were lost after a catastrophic in-flight engine failure on 5 June 1968. (Author's Collection)

This is the famous 'Mach Three Plus Club' card of Bob Gilliland, who was the brains behind this club. Gilliland was one of the few pilots to have flown most Blackbird family members: the A-12, A-12B, YF-12A, SR-71A, SR-71B, and the SR-71C. Blackbird designer Clarence L. 'Kelly' Johnson signed the card. (Author's Collection)



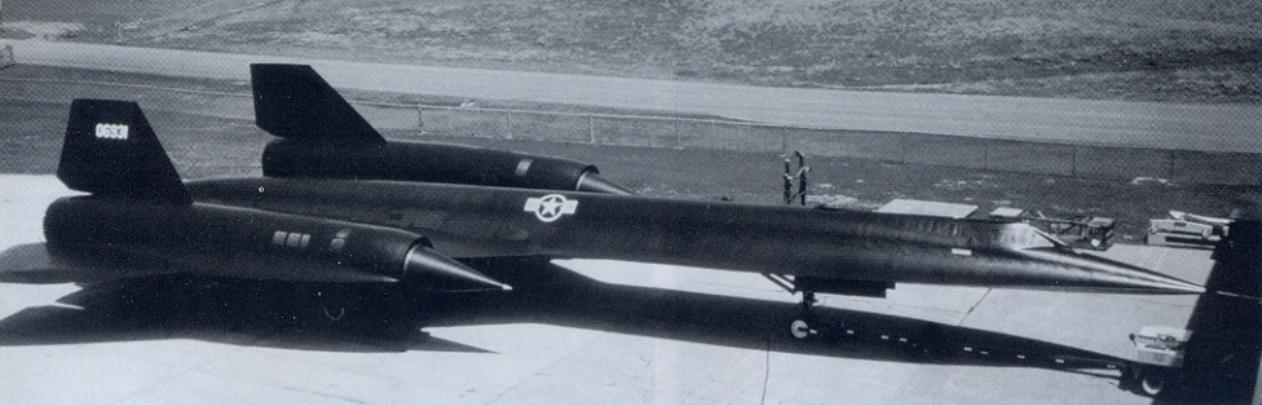


(Above) The second A-12 (122/60-6925) takes on fuel from a KC-135Q (58-0099). This Blackbird was a dedicated flight test aircraft and spent much of its time on Radar Cross Section (RCS) testing. The aircraft was then returned to the Skunk Works to have its cockpit modified to SR-71 configuration. In effect, this change made this particular A-12 a single-place SR-71. Blackbird 122 was retired after 161 flights totaling 177.52 flight hours. This is the first time this photo has been published of a natural metal and black A-12 taken in flight. (Tony Landis Collection)

(Above Right) The initial A-12 (121/60-6924) performs a fuel dump test over the Nellis/Nevada Test Site ranges. All Blackbirds had a vent mounted in the tailcone for fuel release, to lighten the aircraft for landing. This A-12 never incorporated the composite structure and panels found on operational and other flight test A-12s. (Tony Landis Collection)

(Right) From the beginning, it was rumored that the three operational A-12s flying BLACK SHIELD operations from Kadena Air Base (AB), Okinawa (aircraft 127, 129, and 131) had bogus red tail numbers. This fact is confirmed by these nine Blackbirds stored at Palmdale. The airframes are (front to back): A-12s 131/60-6937 (the last A-12 to fly an operational mission and the final A-12 to fly), 127/60-6930 (shown in its operational BLACK SHIELD red serial number, 77835), 132/60-6938, 128/60-6931, 122/60-6925, 130/60-6933, 124/60-6927 (the sole A-12B 'Titanium Goose'), 121/60-6924, and – in the back – the M/D-21 Mother bird (134/60-6940). Project BLACK SHIELD was a series of A-12 missions over North Vietnam between 31 May 1967 and 8 May 1968. (Tony Landis Collection)

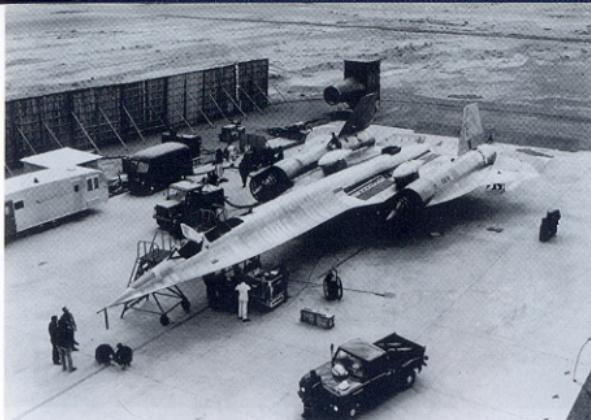




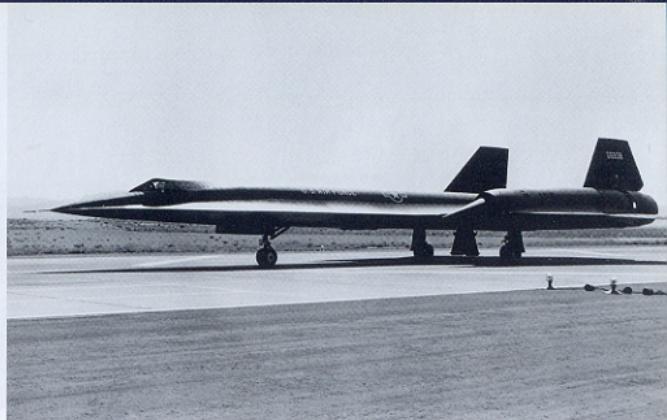
(Above) One of the finest examples of an A-12 on public display is the A-12 (128/60-6931) now owned by the Minnesota Air National Guard (MNANG). This Blackbird is photographed from a vantage point on the roof of the MNANG's Museum at Minneapolis-St. Paul International Airport. It is freshly painted in standard Air Force markings, which depict the look of all A-12s at the end of their flying careers in 1968. (Author)



(Left) For every take-off, there should be an equal number of landings; however, this was not always the case during the A-12/SR-71 program. Lou Schalk lands the initial A-12 (121/60-6924) after its first official test flight on 30 April 1962. All take-offs and landings at the 'Area 51' facility were from the south to the north on runway 34/16. This 8500 foot (2591 m) long runway was built specifically for A-12 operations. (Author's Collection)



(Above) One of the first problems encountered during the A-12 flight test program concerned severe fuel leaks. It turned out that when the A-12 was being assembled someone forgot to install the water-soluble clay used to seal the tanks. To get around this problem until it could be corrected, Lockheed secured a pair of surplus aircraft fuel tanks. These tanks were mounted atop the wing, and Lockheed was then able to carry out ground based engine run up tests in March of 1962. No flights were ever made with these tanks mounted on the airframe. (Lockheed via Tony Landis)



(Above Right) Painted in its new all-black paint scheme, the 12th A-12 (132/60-6938) taxis down the 'Area 51' (Groom Dry Lake) ramp for a training flight. After accumulating 369.55 flight hours during 197 flights, and spending 30-plus years in storage, #132/938 was retired to the USS ALABAMA Museum in Mobile, Alabama. (Author's Collection)



(Right) The first of only two M/D-21 drone launch Blackbirds (134/60-6940) readies for its first captive flight from Groom Dry Lake on 22 December 1964. A Lockheed D-21 drone is attached to a launch pylon mounted on the M-21's rear spine. The M-21 incorporated a Launch Control Officer (LCO) cockpit immediately aft of the pilot for the drone program, which the CIA code named TAGBOARD. (Author's Collection)



(Above) The sole A-12B two-seater (124/60-6927) taxis south on the 'Area 51' taxiway prior to launching on a training mission. This trainer was nicknamed the 'Titanium Goose' and incorporated a second cockpit for the instructor immediately aft and above the standard cockpit. The raised aft cockpit gave the instructor good forward visibility. Flat Black paint covers the composite leading edges, while the remainder (including the vertical stabilizers) were left in natural metal. This A-12B was powered by two 24,500 pound thrust Pratt & Whitney J75 afterburning turbojet engines, which were fitted to other A-12s for early test flights prior to retrofitting with the definitive 34,000 pound thrust J58 engines. The A-12B's maximum speed was only Mach 1.8, due to its lower-powered J75s. The 'Goose' is the only Blackbird that it's designer, Clarence 'Kelly' Johnson, ever rode. (Author's Collection)



(Left) The late John Andrews of Testors took the first public photograph of an A-12 at Air Force Plant 42, Site 2, Palmdale, California. It seemed John had a magical way about him and convinced the security personnel at Det 6, Norton Air Force Base (AFB), California they should allow him access and a photographic opportunity. In the foreground is the seventh A-12 (127/60-6930), which was retired in 1968 after 258 successful flights totaling 499.1 hours of flight time. This Blackbird is now displayed at the Redstone Arsenal Space & Rocket Center Museum in Huntsville, Alabama. The A-12B 'Titanium Goose' (124/60-6927) is parked in the background. It was retired with 1076.25 hours of flight time during 614 flights. The 'Goose' now resides as a tribute to the men that flew it at the Museum of Science and Industry in Los Angeles, California. (John Andrews)

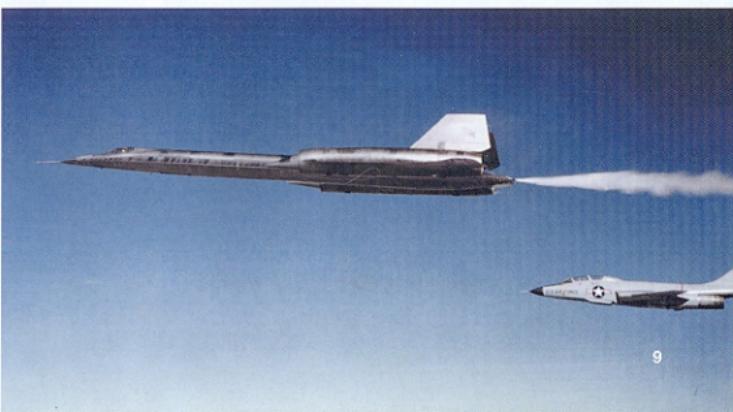


The first A-12 lost in service was the third aircraft (123/60-6926), which Ken Collins piloted on a test flight on 24 May 1963. The Blackbird's nose-mounted static pilot tube failed in-flight, which resulted in bogus air speed and Angle of Attack (AOA) readings. This failure caused Collins to fly the A-12 outside its flight envelope and to pitch up. Collins' only recourse was to bail out of his stricken aircraft, which crashed near the Nevada/Utah border town of Wendover. At the time of the loss, A-12 number 123/926 had accumulated 79 flights with a total of 135.2 hours of flight time. This photo appears to be taken over the Nevada Nuclear Test Site, just west of 'Area 51'. Just above the port inlet appears to be the Sudan crater in the northeast corner of the Nevada Test Site. (Tony Landis Collection)

Early in its flying career, the all-metal A-12B launches from the 'Area 51' runway. The 'Titanium Goose' had the all metal chine area, inlet cones, and the wing and elevon leading and trailing edges painted Flat Black later in the program. This move was consistent with the balance of the A-12 fleet. (Tony Landis Collection)



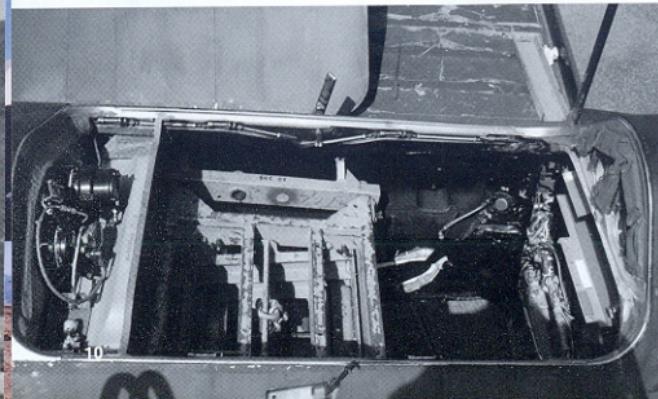
The first A-12 (121/60-6924) vents fuel during one of its test flights from Groom Dry Lake. This aircraft is closely followed by a McDonnell F-101B Voodoo (56-266). It was one of several Voodoos assigned to fly chase on the A-12 test program. The F-101B – a long-range, all-weather interceptor – had a maximum speed of 1094 MPH (1761 km/h) at 35,000 feet (10,668 m) and a maximum range of 2146 miles (3454 km). (Tony Landis Collection)





Both hatches (upper and lower) have been removed from the 'Q' bay immediately aft of the A-12's cockpit. This space gives an idea of the size of this bay and of the Perkins-Elmer Type 4 camera that filled it. This pressurized, air-conditioned bay proved to be a perfect starting point for the second seat incorporated in the follow-on SR-71. (Author)

The upper 'Q' bay hatch has been removed to reveal the camera ballast and other components fitted inside this area. The camera ballast was installed when the camera itself was not fitted and both items weigh approximately 830 pounds (376.5 kg). The INS bay is located aft of the 'Q' bay. (Author)

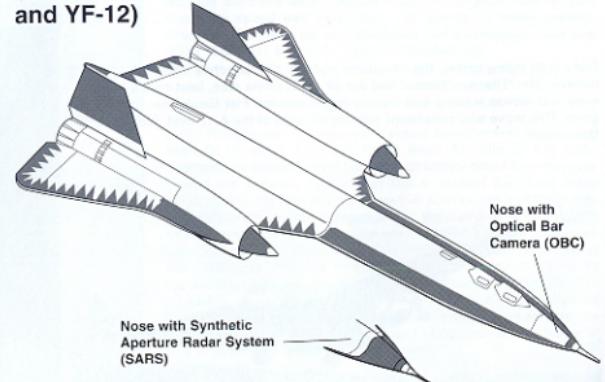


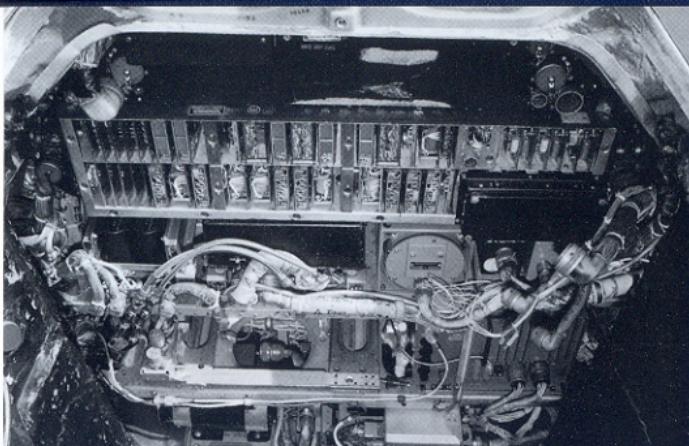
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The Inertial Navigation System (INS) bay immediately aft of the 'Q' bay has two access panels. The left panel has been removed to reveal its thick insulation blanket. This insulation was required throughout the A-12 to protect the delicate instruments housed inside the bay from extreme temperatures generated in flight. (Author)

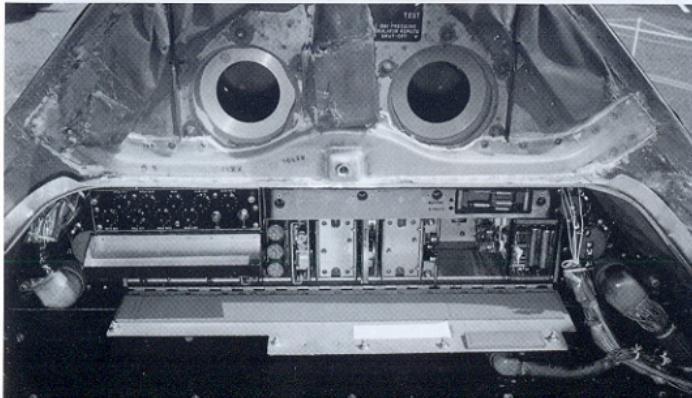
Composite-Honeycomb Areas (in Gray) (SR-71A illustrated; these were also used on A-12 and YF-12)





All mission essential equipment is housed in the 'E' bay. Some of these components are viewable from the top of the open 'Q' bay. The colors here are titanium, black paint, and a reddish-orange colored insulation blanket used on all Blackbirds. (Author)

The Honeywell Stabilization Augmentation System (SAS) is fitted in the top equipment rack above the open 'E' bay. The SAS was one of the most essential flight hardware systems in any Blackbird and worked in conjunction with the autopilot and the Mach trim system to provide input to the Automatic Flight Control System (AFCS). (Author)



The lower 'Q' bay hatch is opened to reveal equipment mounted in this section. This bay housed all the flight essential hardware, including the autopilot, the SAS, and all the radio and navigational equipment. The equipment is located behind a removable pressure bulkhead at the forward end of the 'Q' bay. (Author)





The lower 'Q' bay hatch has been removed from an A-12 to reveal five circular camera ports. The four side ports are covered from the inside for protection. The Perkins-Elmer Type 4 camera mounted in the A-12's 'Q' bay had a 60-inch (152 cm) focal length lens for close views of key objectives. (Author)



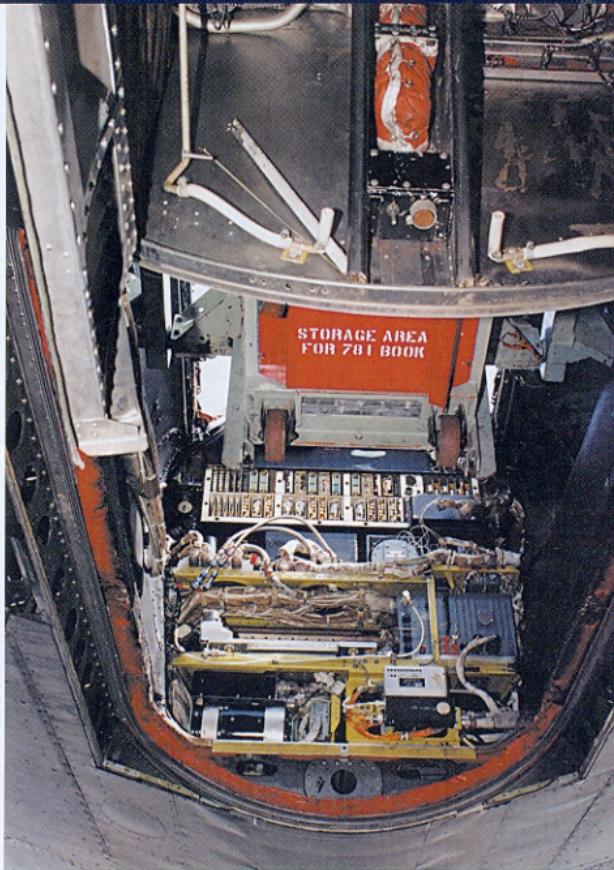
The upper 'Q' bay hatch has been removed and placed on a workstand behind this A-12. Two rectangular items on each side of the open hatch are the hatch locking mechanisms. These devices are in the open position and lowered aft to close flush with the aircraft's skin. (Author)

A periscope attached to a 16mm camera is mounted atop the A-12 'Q' bay hatch. This periscope was vital in determining post-flight threat analysis. The value of this unit was during an overflight mission, if and when the A-12 was detected by radar, the camera would start taking one frame per second until the threat ended. Photo laboratory technicians developed the film, which had tell tale signs of Surface-to-Air Missile (SAM) contrails and their detonations. (Author)

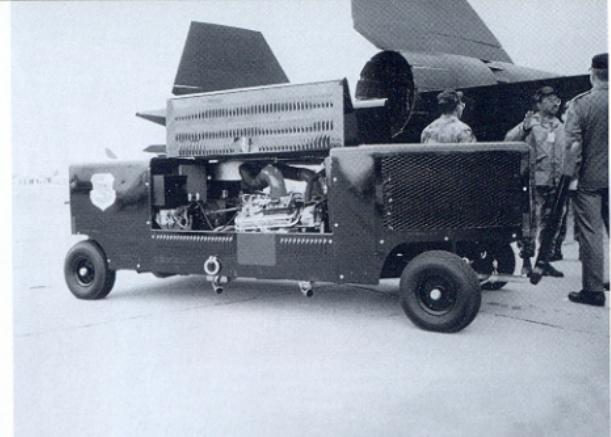




The camera ballast assembly is mounted in the rear of the A-12's 'Q' bay, whose lower hatch has been removed. A 781 forms box is fitted to the ballast. This box holds all maintenance reports and other pertinent airframe data the crew chief keeps on this aircraft. Castor wheels allow this box to be rolled on the ground when removed from the aircraft. A-12s carried camera ballast assemblies when not equipped with cameras to preserve their Center of Gravity (CG). (Author)



The bulkhead cover has been removed from the 'Q' bay's forward section. This reveals the electronic equipment fitted on racks in this section of the bay. The equipment was used to monitor both Electronic Intelligence (ELINT) and Signals Intelligence (SIGINT) during missions. (Author)

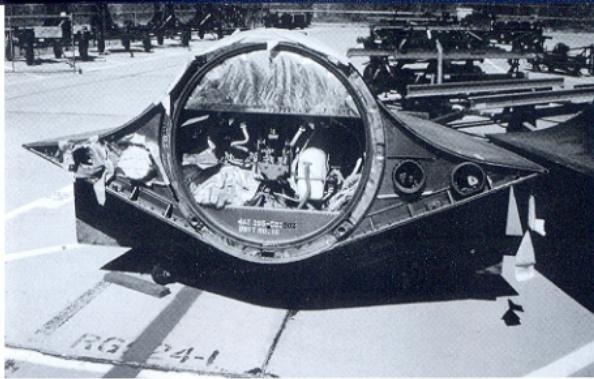


(Above Left) The original A-12 start cart used two race prepared, 401 cubic inch (6571 cm³), 400 horsepower (hp) Buick nail head engines. This cart was conceived by two Skunk Works engineers who raced cars. It was natural for them to use their knowledge of race car engines in putting together this engineering marvel. (Author)

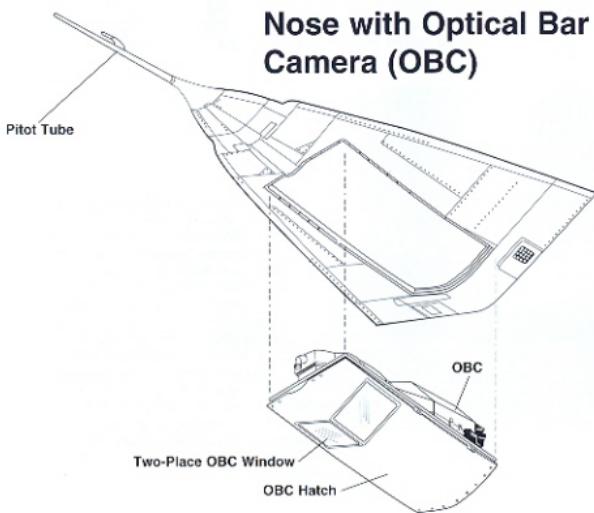


(Above) During the development of the A-12 and its fellow brothers, the YF-12 and the SR-71, there was a requirement to be able to start the massive Pratt & Whitney J-58s at both the home station and deployed locations throughout the world. In later years, the portable start carts were powered by two LS-7, 454 cubic inch (7440 cm³), 465 hp Chevy Big Block engines. Chrome valve covers are fitted to these engines. The sound for two unmuffled Chevy Big Blocks is almost as awesome as the sound of a Blackbird taking off! (Author)

(Left) Lockheed worked with Garrett AirResearch to develop an air start system that was installed in each of the SR hangars at Beale AFB, California, the former home of the SR-71. These units are small and highly portable alternatives to the engine start carts. Standard issue aircraft air-driven start carts were retained for use at deployed locations. (Tony Landis)



The backside of an SR-71 Optical Bar Camera (OBC) nose assembly is exposed during open storage. The 30-inch (76 cm) OBC was capable of photographing 100,000 square miles (258,980 km²) of territory per hour. Warm and dry weather most of the year allowed for outside storage at the SR-71 Overhaul Facility, which was located at Air Force Plant 42, Site 2 in Palmdale, California. (Author)

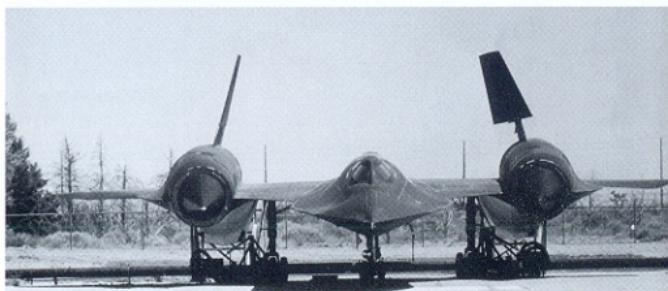


Nose with Optical Bar Camera (OBC)



Standard red protective equipment panels are fitted to the starboard side of this SR-71 Advanced Synthetic Aperture Radar (ASAR) nose. The Loral ASAR is used for oblique scans of enemy territory. Just behind the ASAR nose are two engine inlet cones – each approximately nine feet (2.7 m) long. (Author)

The port vertical fin is turned to the left, while the starboard fin remains centered on this SR-71A (2004/61-7973). The aircraft is stored at Site 2 in Palmdale, prior to going on display at Blackbird Air Park alongside the first A-12 (121/60-6924). The all-moving vertical fins moved up to 20° to either port or starboard. These surfaces were usually centered when a Blackbird was publicly displayed. (Author)





The M/D-21 program (TAGBOARD) was conceived after Francis Gary Powers' U-2A was downed over the Soviet Union on 1 May 1960. Part of the terms of his release was a promise by then-President Dwight Eisenhower to cease all manned overflights of the Soviet Union. The first of only two M-21s built (134/60-6940), with D-21 number 504 on its back, is serviced on the north side of hangar 3 at Area 51. (Lockheed via Tony Landis)



The M/D-21 combination flies over Nevada during the first captive flight on 22 December 1964. A Launch Control Officer (LCO) sat in a cockpit located in the A-12's 'Q' bay. This M-21 now resides in a place of honor at the Museum of Flight in Seattle, Washington. The museum's aircraft was retired after 80 flights totaling 123.55 flight hours. (Author's Collection)



The M/D-21 combination on its 22nd captive flight from Groom Dry Lake. The aircraft is shown from a low angle, highlighting the unique configuration of the two aircraft. The aircraft has the tail code '6940' visible on the vertical stabilizer.

The M/D-21 combination rolls away from the camera aircraft during the captive flight from Groom Dry Lake. Flat Black paint covered the mother aircraft's leading edges, along with the aerodynamic covers fitted over the D-21's exhaust orifice. The remainder of both 'Motherbird' and drone are left in natural titanium. Lockheed's D-21 had a wingspan of 19 feet 9 inches (6 m), a length of 42 feet 10 inches (13.1 m), and a height of 7 feet 0.25 inch (2.1 m). It had a maximum weight of 11,000 pounds (4990 kg). The drone was powered by one 1500 pound thrust Marquardt XRJ43-MA20S-4 ramjet engine, which powered the D-21 up to 2500 MPH (4023 km/h) – Mach 4 – at 80,000 feet (24,384 m). Its maximum altitude was 95,000 feet (28,956 m) and its range was 3455 miles (5560 km). (Author's Collection)



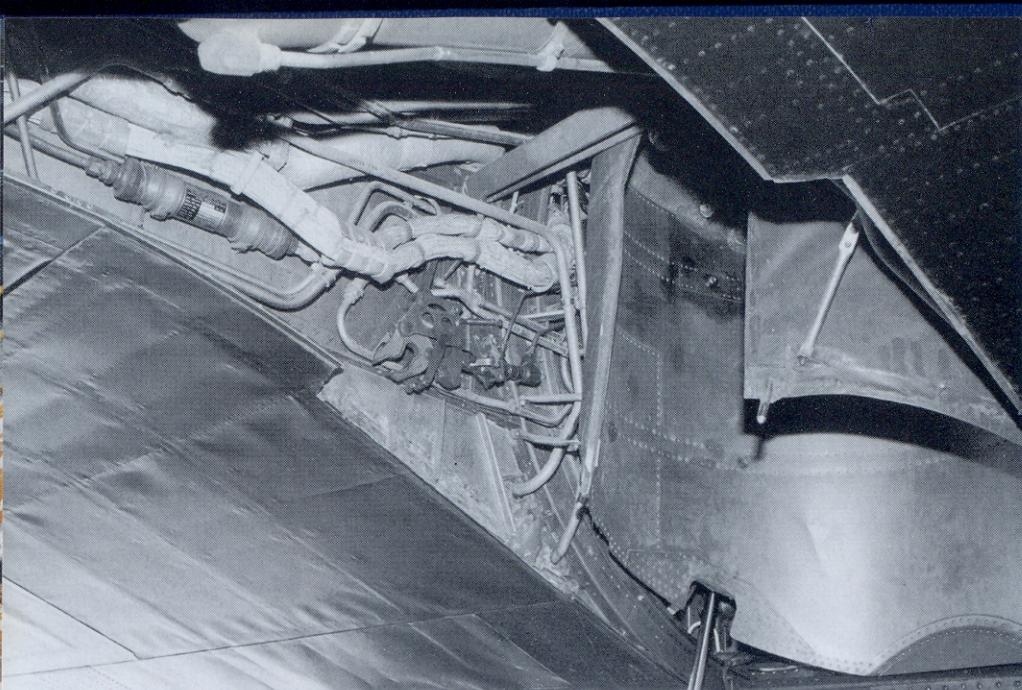
The first mating of a D-21 to an M-21 occurred at 'Area 51' just days before the first captive flight on 22 December 1964. Lockheed engineers are winching this drone just left of the M-21 'Motherbird' (134/60-6940). D-21s were designed for launching when the M-21 was flying at Mach 3.2 at 80,000 feet (24,384 m). (Lockheed via Buddy L. Brown)



The M/D-21 combination approaches a KC-135 tanker for a refueling. The drone's aerodynamic engine covers are removed. The second M-21 (135/60-6941) was lost during a D-21 launch attempt off the California coast on 30 July 1966. The 'Motherbird' pitched up into the drone immediately after separation from the M-21's pylon. (Author's Collection)

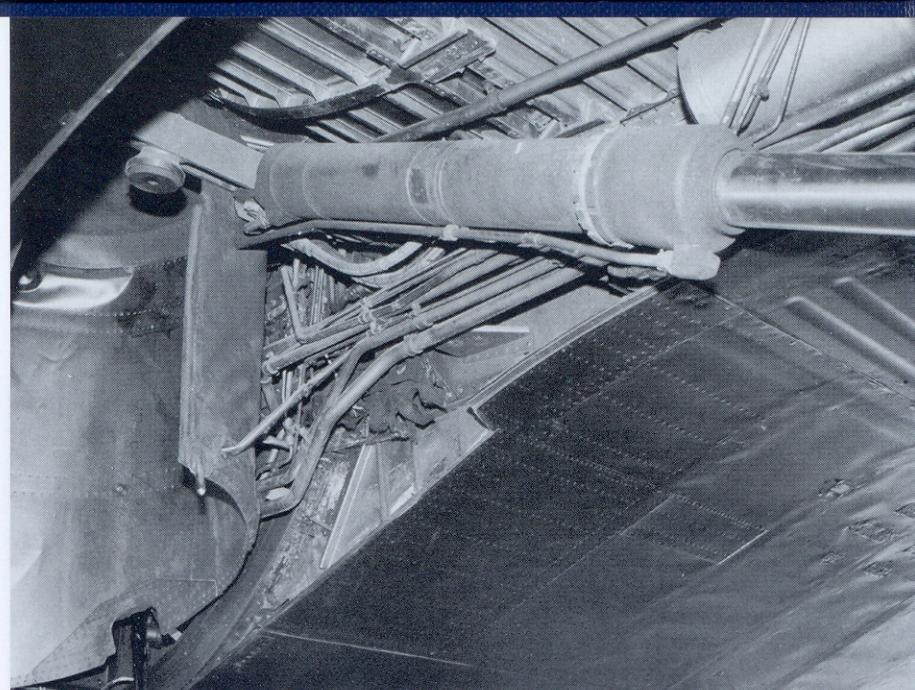


The CIA publicly released this first M/D-21 image in the summer of 1982. Both John Andrews and I received this copy with a brief note saying "we found this in our files and wondered if it would be of any interest to you" and it was signed by a CIA security manager. (Author's Collection via the CIA)



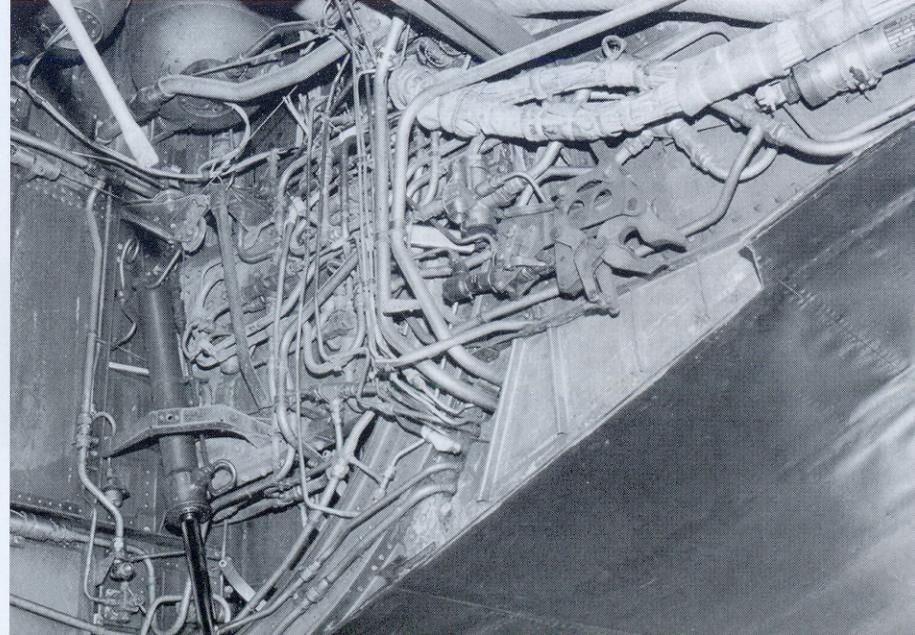
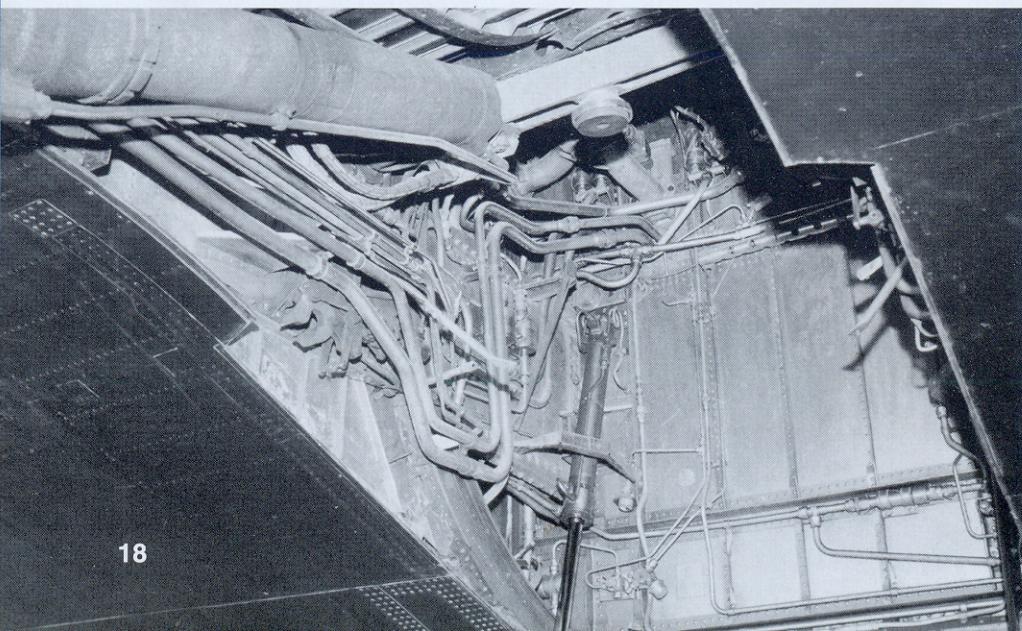
The Blackbird's main landing gear wheel well has a tire can installed. The tire can that shields the well from damage if a tire bursts in flight and covers up most of the detail in the well. Rubber-like reddish insulation material covers most of the other temperature sensitive areas of the Blackbird. (Author)

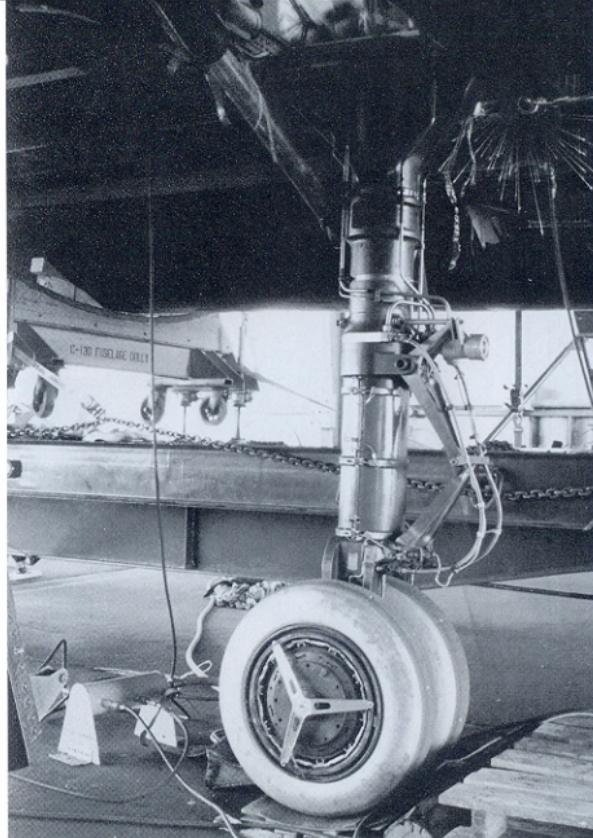
With the tire can removed, it becomes apparent the wheel wells of the Blackbird looks more like a can of worms than that of the world's only Mach 3 spy plane. The flat area along the centerline of the Blackbird is what separates the main landing wheel wells. The thickness of most of the material used on the Blackbird is 25 to 30 thousands of an inch thick titanium. (Author)



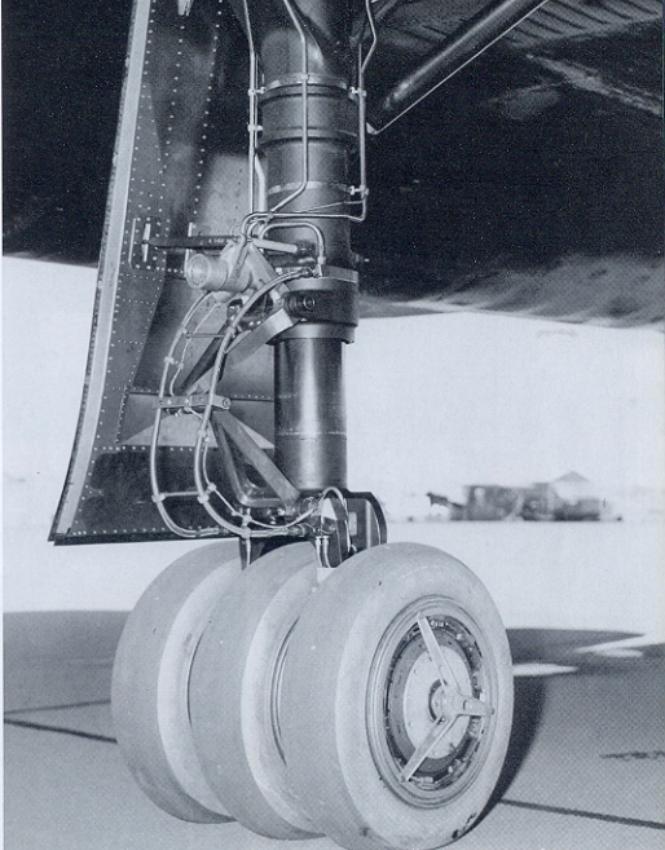
The main landing gear well is viewed from the rear of the Blackbird's undersurface. The massive hydraulic landing gear actuator is colored a dark rusted brown color with the ram part chrome. Just above the hydraulic actuator is an inline fuel filter. Most of the color in the wheel well is natural metal. (Author)

The right hand main landing gear wheel well looking forward. The white line that appears in the upper left-hand corner of the photo is one of the attachment points for the tire cans. After several years of flying with the cans installed, it was decided that they served no useful purpose and were removed. (Author)

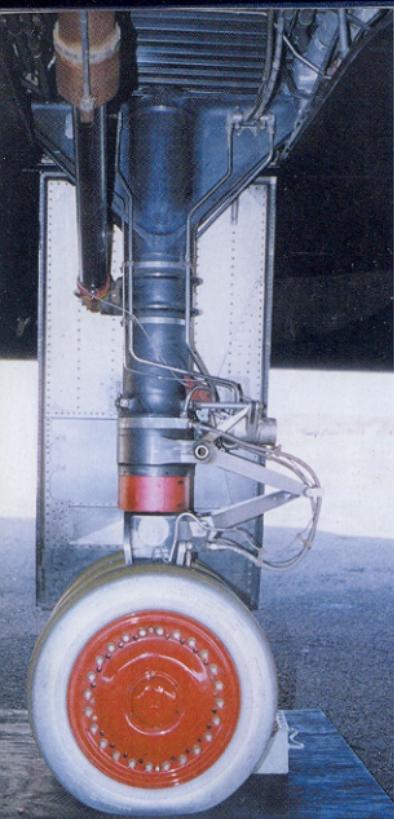




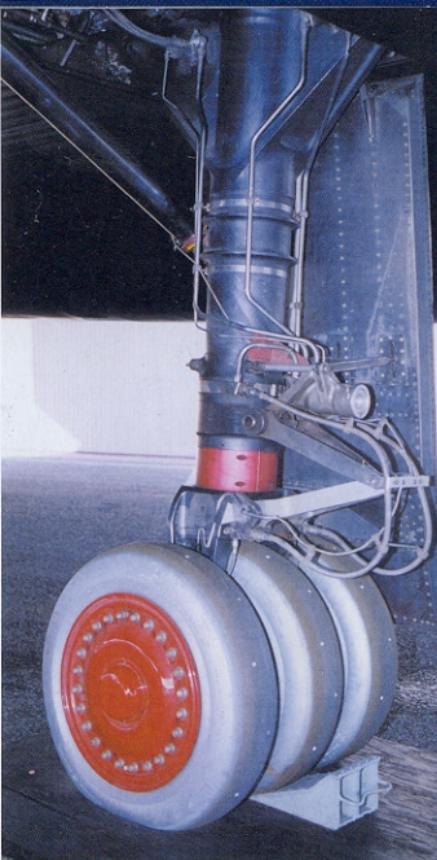
All Blackbirds have the same basic main landing gear assembly, with minor wheel changes among variants. This YF-12 dispensed with the A-12's wheel covers, replacing this item with a three-spoke assembly over the open wheel. The open wheel provided a more efficient means of reducing heat in the brake assembly. The YF-12 was approximately three tons heavier than the A-12, while the SR-71 outweighed the A-12 by approximately ten tons. (Author)



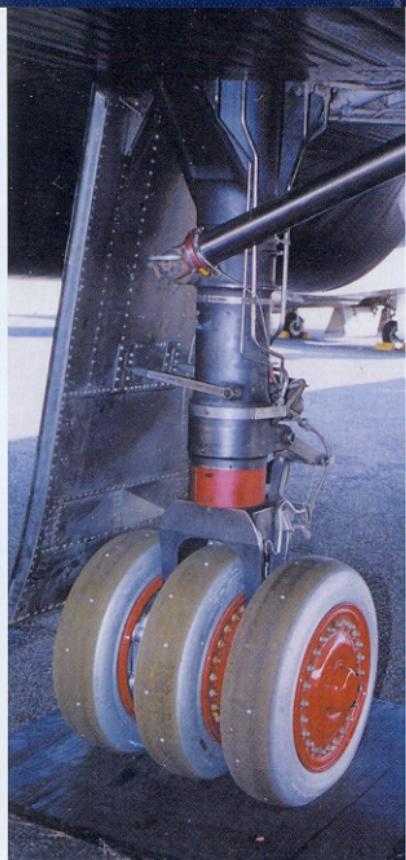
The BF Goodrich Company built all Blackbird main landing gear tires, which were painted silver to reduce heat. This SR-71 has a similar main landing gear to earlier Blackbirds. The main gear assembly forging is a dark gunmetal color, while all the brake lines and other associated plumbing are stainless steel. (Author)



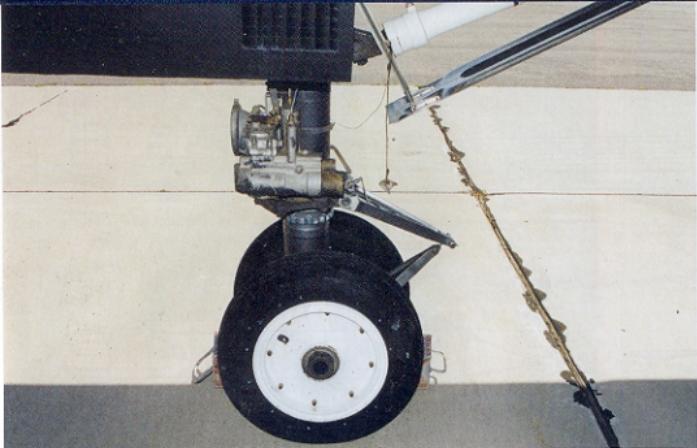
A-12 main landing gears featured a wheel painted either glossy red (here) or gloss green. The gear sits in its normal position with the oleo (shock absorbing) strut collapsed. A red metal collar was installed for long term storage only. The anti-skid sensor module is mounted just above the oleo scissor mechanism. (Author)



The scissor strut assembly is mounted on the front of the A-12's main gear strut. The all-metal wheel assembly is the only major difference between the A-12's main landing gear assembly and the assemblies on later YF-12s and SR-71s. (Author)

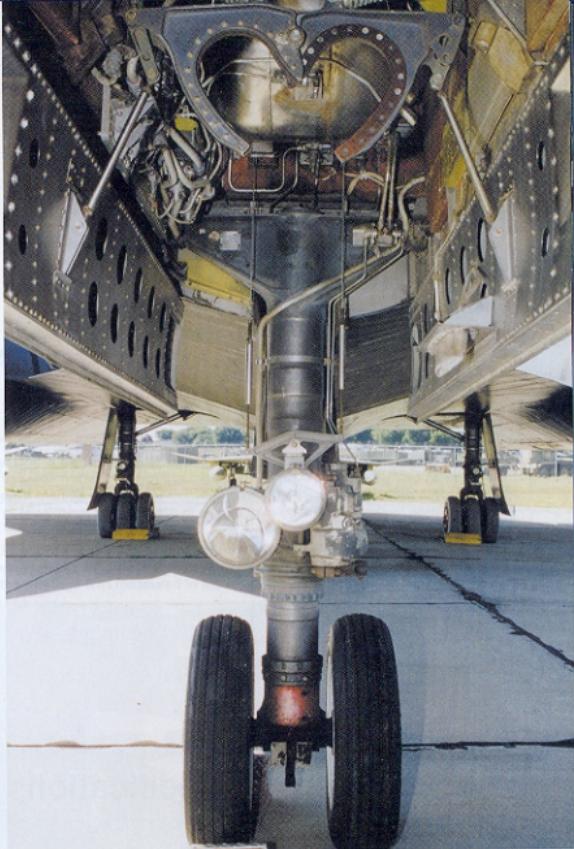


The main gear hydraulic actuator attaches to the main landing gear's aft section. Three main door links attach to the main landing gear. The gear actuator strut mounted on the upper main strut pulls the gear into its bay. (Author)

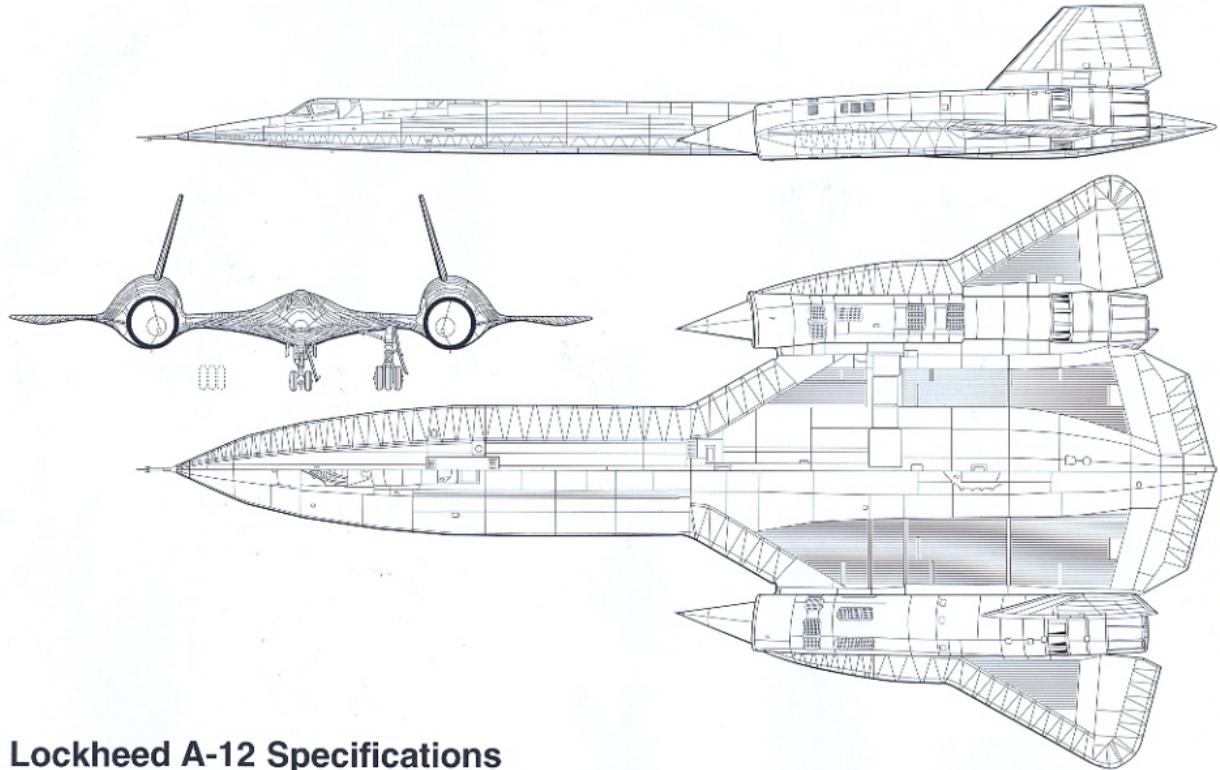


The A-12's nose landing gear has gloss white painted nose wheels. This color was observed on all A-12s stored at Site 2 in Palmdale. BF Goodrich tires are fitted to both nose wheels. There is little or no difference between the nose gear assembly of the A-12 and the later YF-12 and SR-71. (Author)

The forward retracting nose gear hydraulic ram and associated plumbing are mounted to the aft nose landing gear strut. When the Blackbird is being towed, the oleo scissor linkage is disconnected to avoid damage to the steering mechanism. (Author)



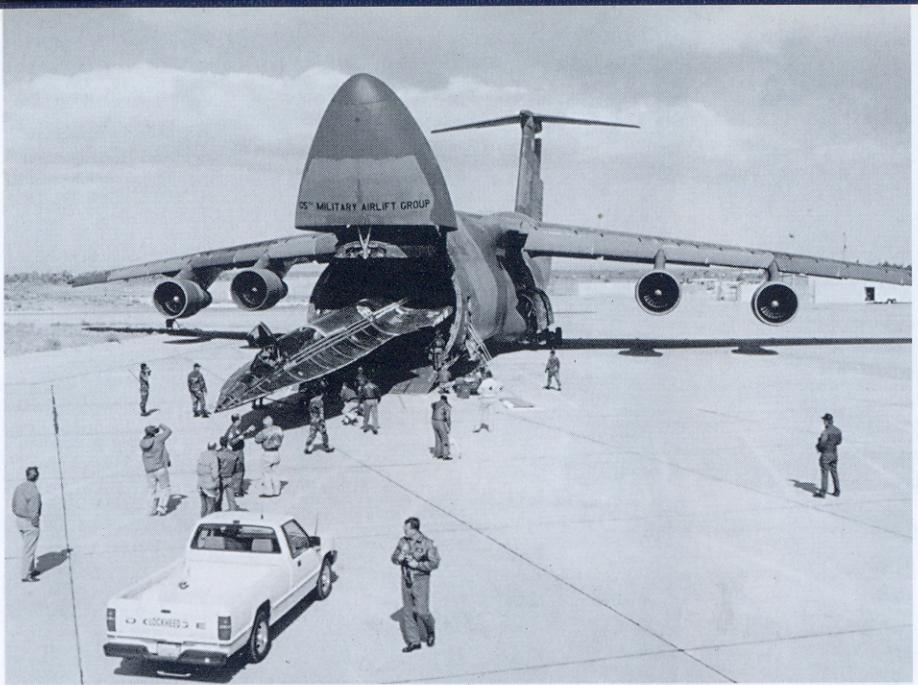
All metal areas in the A-12's nose gear wheel well are unpainted and vary depending on whether or not they are titanium, stainless steel, or plastic/composite materials. Insulated access panels in the wheel bay are made of a reddish rubber-like material. All A-12s had dual nose wheel landing lights. Stainless steel brake and steering tubing runs down the main gear strut. (Author)



Lockheed A-12 Specifications

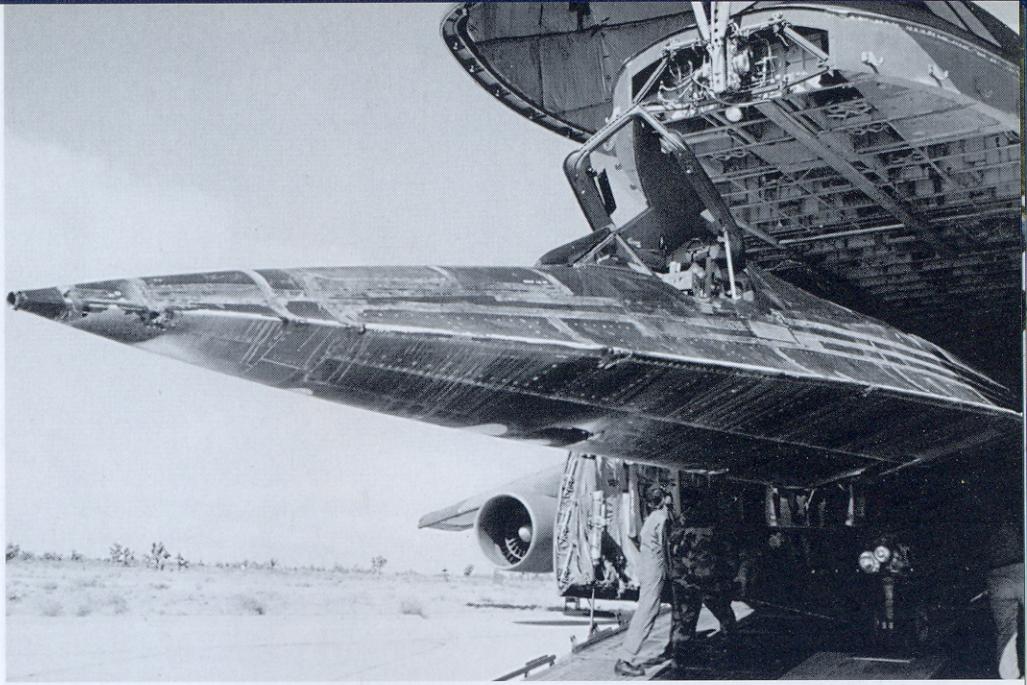
Wingspan:.....56 feet 7.4 inches (17.3 m)
 Length:.....102 feet (31.1 m)
 Height:.....18 feet 4 inches (5.6 m)
 Empty Weight:.....38,000 pounds (17,237 kg)
 Maximum Weight:.....140,000 pounds (63,504 kg)
 Powerplant:.....Two 34,000 pound thrust Pratt & Whitney
 JT11D-20 (J-58) afterburning turbo-ramjet
 engines

Armament:.....None
 Maximum Speed:.....Mach 3.35 – 2275 MPH (3661 KM/H) at 80,000 feet
 (24,384 m)
 Maximum Altitude:.....95,000 feet (28,956 m)
 Range (Unrefueled):.....2500 miles (4023 km)
 Crew:.....One



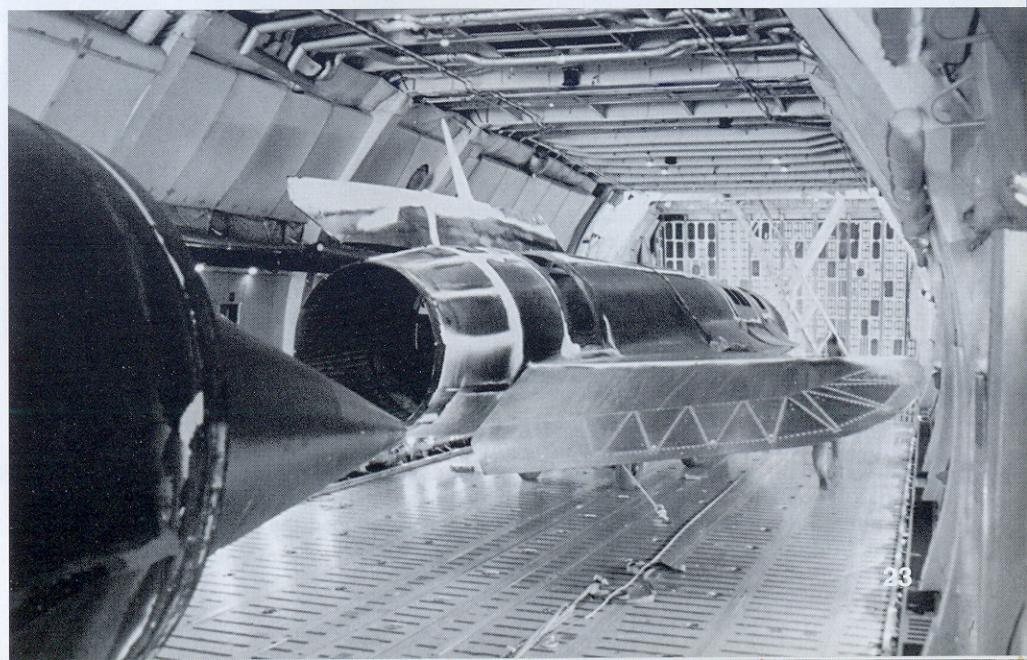
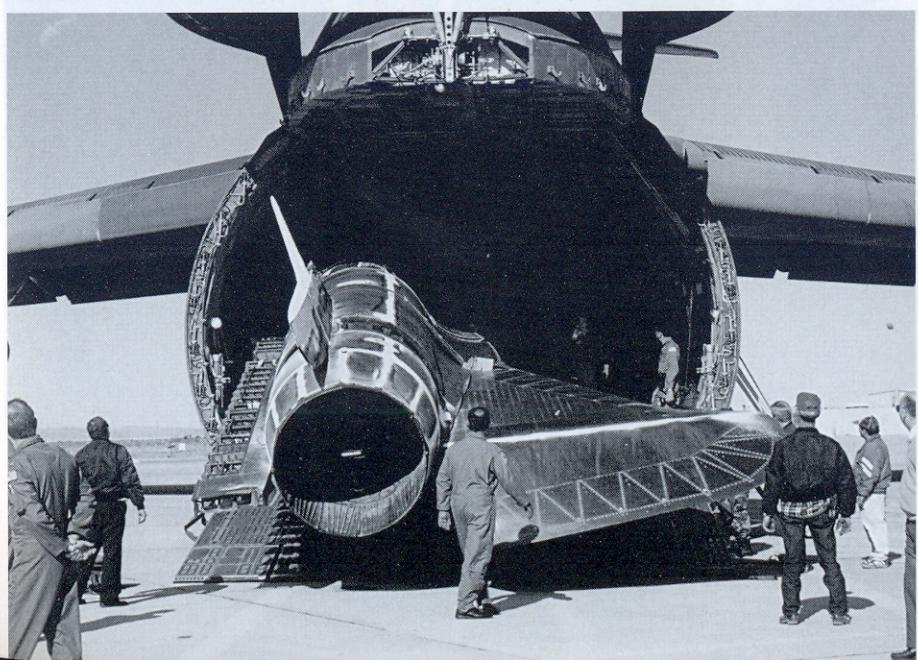
The Minnesota Air National Guard (MNANG) Museum moved their A-12 (128/60-6931) to Minneapolis/St. Paul, via two Lockheed C-5A Galaxies of the 105th Airlift Wing (AW), New York ANG. The Blackbird was disassembled at Palmdale, California prior to its' delivery to Minnesota on 27 October 1991. (Author)

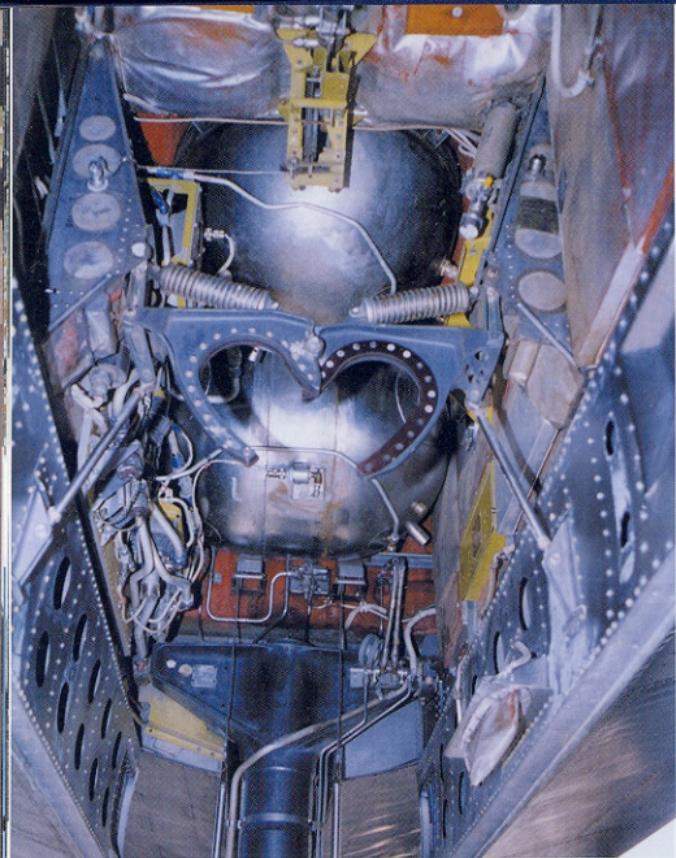
Both engine nacelles were removed from the MNANG's A-12 prior to loading aboard the second of two 105th AW's C-5As. New York ANG personnel help load the starboard nacelle and wing into the Galaxy. Residue from the white airframe preservative remained on the A-12 during its move from Palmdale. (Author)



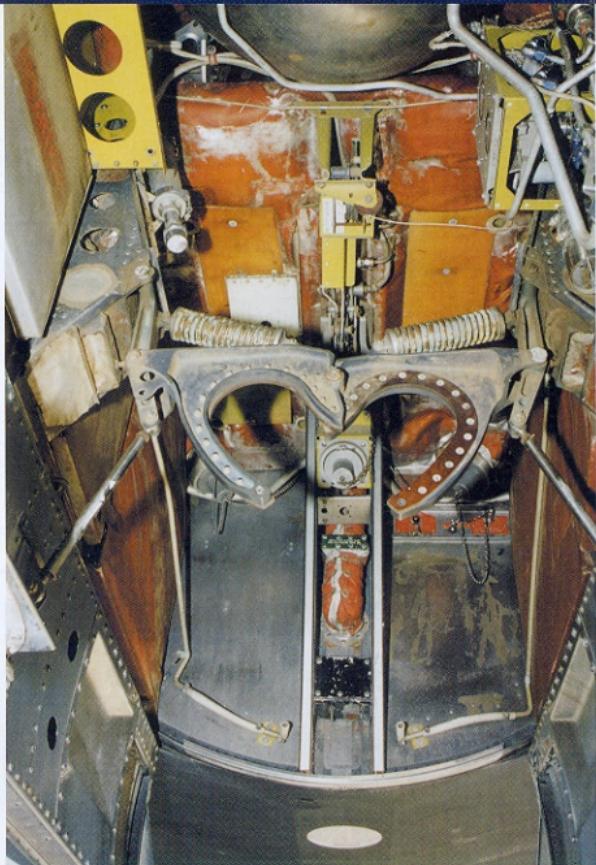
The A-12's fuselage is carefully loaded onto a New York ANG C-5A. Most airlift units needed extensive upgrade training in moving oversize cargo. This training had been set aside for almost 18 months because of the 1991 Gulf War. Many of the 105th AW's 'weekend warriors' needed to get their 15 days of annual training in at the earliest possible time. (Author)

The starboard nacelle and wing is secured in the C-5's cargo hold, with the port nacelle and wing located aft of the other nacelle. In both cases, the overall clearance for the nacelles and the fuselage was measured in inches or less. (Author)





The A-12's nose landing gear strut was mounted in the aft end of the nose gear bay and retracted forward. Door actuators mounted in the bay pulled up the doors during gear retraction and opened these doors during gear extension. Two spherical 28 gallon (106 L) tanks of liquid nitrogen are mounted in the aft nose well ceiling. Liquid nitrogen was used to purge the fuel tanks while they emptied, which reduced the risk of a fuel tank explosion. (Author)

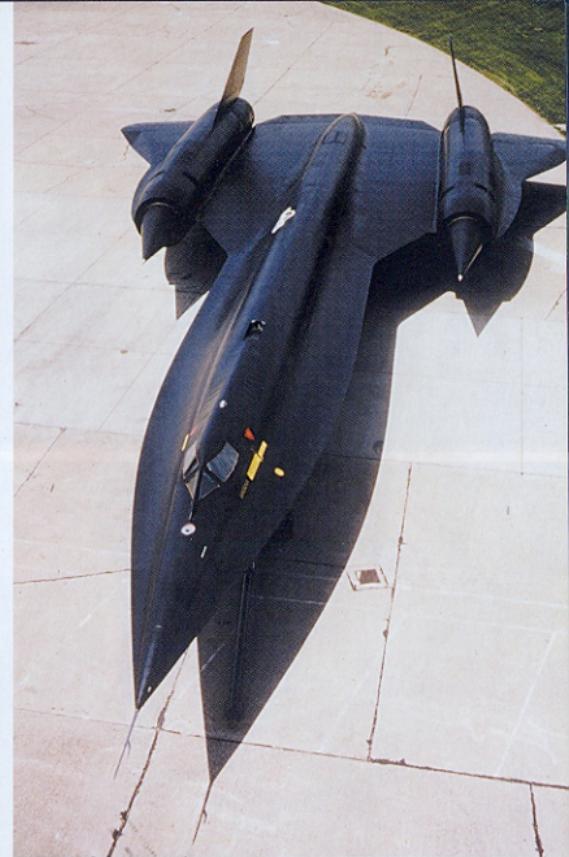


Reddish-brown insulation material is fitted to the ceiling of the A-12's forward nose gear bay section. This material helped reduce temperatures to the equipment fitted above the nose gear bay. The gear door actuator mechanism simultaneously closed or opened the port and starboard gear doors. (Author)



The first A-12 (121/60-6924) is parked beside the 22nd SR-71A (2024/61-7973) at Blackbird Air Park in Palmdale. The single-seat A-12 had a shorter nose with an increased taper to the nose probe than the two-seat SR-71. The SR-71's Reconnaissance Systems Officer (RSO) cockpit was located aft of the pilot's cockpit in the position of the A-12's 'Q' bay. (Author)

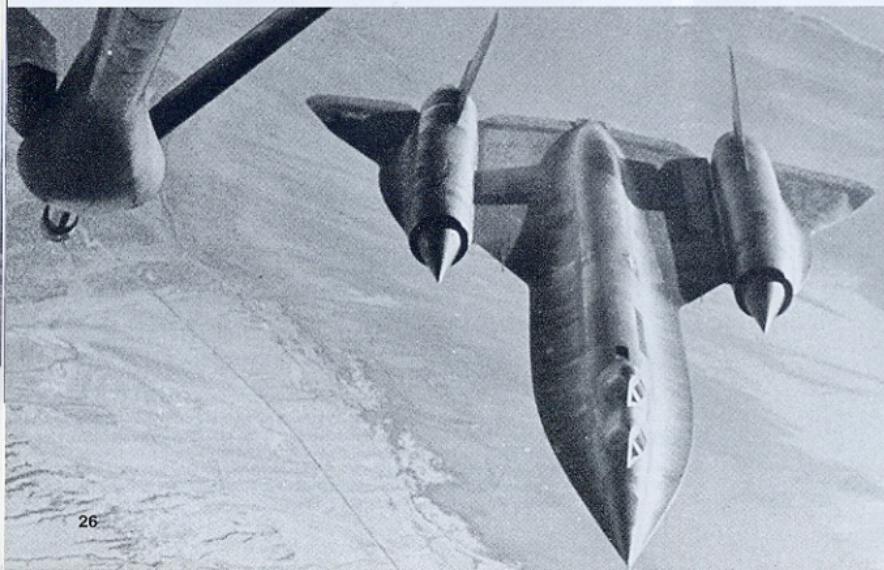
The SR-71 (background) had a longer tail cone than the earlier A-12 (foreground). Lockheed needed additional fuel tanks to compensate for the ten tons (9.1 mt) of additional airframe and sensors when adding the SR-71's second cockpit. Low-flash JP-7 fuel was now carried in the wing for transonic flight and additional space was added to the aft fuel tank. Fuel capacity increased from the A-12's 68,000 pounds (30,845 kg) to over 80,000 pounds (36,288 kg) on the SR-71. (Author)



The Minnesota ANG Museum's A-12 (128/60-6931) is openly displayed any weekend from mid-April to mid-September at the MNANG's base at Minneapolis/St. Paul International Airport. The white circle just in front of the windshield is the periscope viewing port for the sun compass. An identical viewing port located directly beneath the top unit is used for looking for and finding the target. (Author)

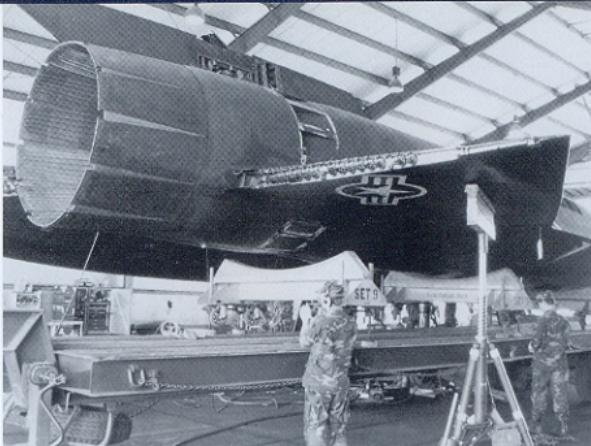


(Above Left) Lou Schalk flies the number one A-12 (121/60-6924) just to the north of Groom Dry Lake during an early fuel dump test. All Blackbirds had a fuel dump vent mounted in the tailcone. This feature allowed the pilot to dump excess fuel prior to landing. Bald Mountain, the highest point on the Groom Range, is directly below the A-12. (Lockheed via Tony Landis)



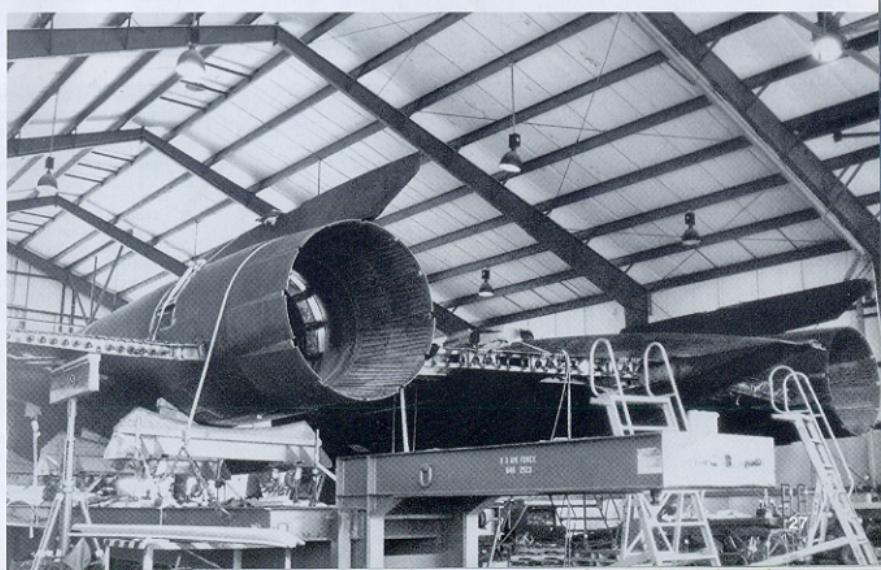
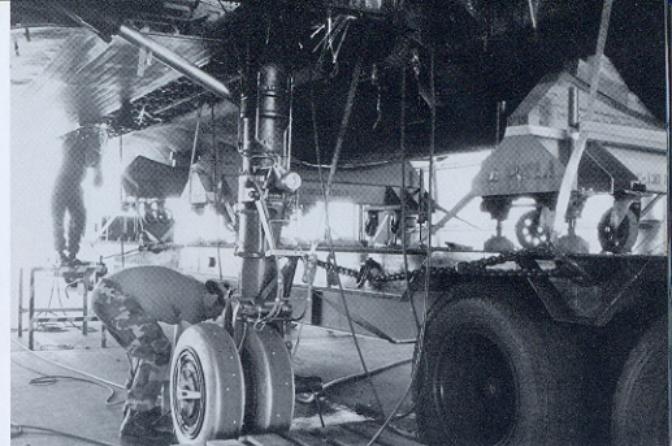
(Above) Jim Eastham lands the first YF-12A (1001/60-6934) on the Groom Dry Lake runway after its initial flight on 7 August 1963. Eastham was Lockheed's Chief Test Pilot for the YF-12 program. The Blackbird streams its brake parachute from a housing in the upper aft fuselage. This aircraft is natural metal with Flat Black (FS37038) radome and leading edges. A Lockheed F-104 Starfighter chase aircraft flies above the YF-12A. (Lockheed via Tony Landis)

(Left) The sole A-12B two-seater (124/60-6927) forms on a KC-135Q tanker prior to an in-flight refueling over the western United States. The 'Titanium Goose' was used for training A-12 pilots that came from other 'fast jet' aircraft. The natural metal A-12B has U.S. AIR FORCE titles and national insignia painted on its fuselage. (Author's Collection)



(Above) The elevon has been removed from the starboard outer wing panel of the sole SR-71C (2000/61-7981). This training aircraft mated the aft section of the initial YF-12A (1001/60-6934) with the forward fuselage from a static test airframe. This resulting aircraft was nicknamed 'the Bastard.' The sole SR-71C had logged only 556.4 hours when it made its last flight on 11 April 1976. Most of these hours were plagued with gremlins and problems. (Author)

(Above Right) Members of the SR-71C recovery team prepare their aircraft for transportation from Beale AFB, California to Hill AFB, Utah. The process took approximately six weeks to accomplish and the Blackbird was eventually moved to Hill via an Air Force Reserve C-5A from Travis AFB, California. (Author)



(Right) Both the inboard and outboard elevons have been removed from the port wing of the sole SR-71C (formerly YF-12A). The all-moving tail sections have been removed, leaving their supports mounted on the nacelle. These fins are canted inward at a 15° angle to both reduce the Blackbird's radar signature and to control surplus offset yaw-thrust during a single-engine flight. The exhaust ejector is an integral part of the airframe and was designed by Lockheed to work with the Pratt & Whitney J-58 turbo-ramjet engine. (Author)



(Above Left) The Blackbird's canopy is removed after unscrewing approximately 12 screws which cover each hinge assembly and three screws which attach the canopy to each hinge. Additionally, technicians must remove the single pin that connects the canopy to the canopy counter balance. Pilot and rear-seater canopies were virtually unchanged on the A-12, YF-12, and SR-71 aircraft. (Tony Landis)



(Above) Both the pilot's and the Reconnaissance System Officer's (RSO's) canopies are opened on this SR-71A (2027/61-7976). This view shows the position of the canopy in relationship to the canopy sills. A single piston mounted on the port side hydraulically opened and closed the canopy. The heat dispersion plate was added to the Blackbird's windshield during its service career. The windows heated up to 400° Fahrenheit (204° Celsius) during sustained flight at Mach 3. Service and warning stenciling was painted using Flat Insignia Red (FS31136), Flat Insignia White (FS37875), and Flat Orange-Yellow (FS33538). (Author)

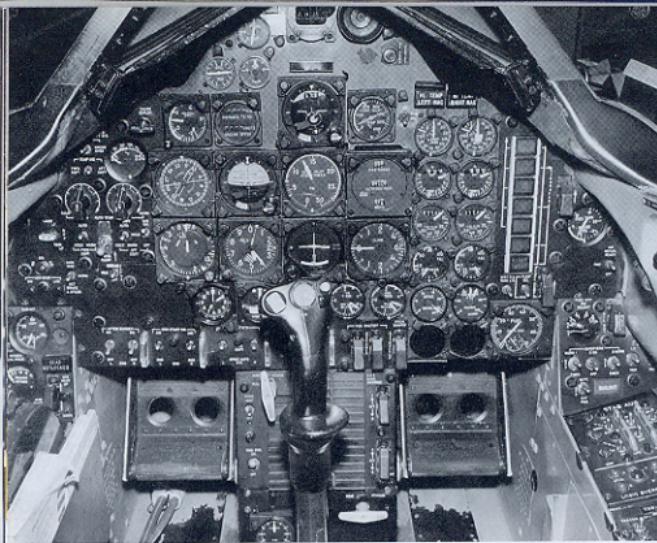
(Left) A special fixture is used to remove the Blackbird's canopy from the aircraft for maintenance. This fixture is designed to lift the canopy off with proper balance and control. The maintenance team must use a hefty block and tackle with the canopy removal fixture, due to the canopy's weight. Inner canopy surfaces are painted Flat Black (FS37038). (Tony Landis)



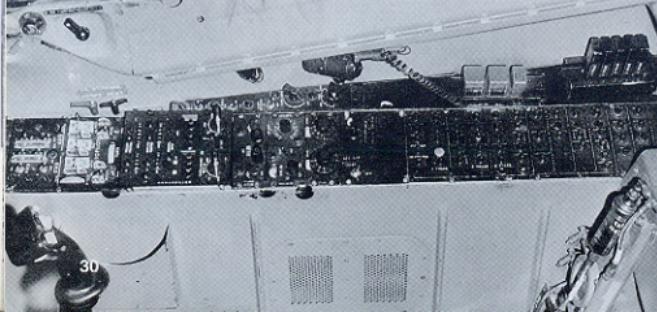
(Above) The eighth production A-12 (128/60-6931) rests on the Minnesota Air National Guard's ramp for a photo shoot on 18 July 1992. The aircraft is displayed by the MNANG at its base, located at Minneapolis/St. Paul International Airport. The starboard side represents 931 as it looked at the end of its flying career in 1968. Special paints were developed for the Flat Insignia Red, Flat Insignia White, and Flat Insignia Blue (FS35044) national markings. These finishes resisted heat-related tarnishing after repeated and sustained high speed flight. (Author)



(Right) The MNANG's A-12 displays Project BLACK SHIELD markings on its port side. No US national insignia was painted on the aircraft for their overflights of North Vietnam in 1967 and 1968. The Flat Insignia Red tail number (77835) was changed on every flight to deceive North Vietnamese intelligence regarding the size of the A-12 fleet. (Author)



The first A-12 (121/60-6924) did not have the typical A-12 instrument layout nor the periscope mounted in the upper center of the forward console. It did have the necessary instruments to achieve Mach 3 flight, but it was never configured for operational missions. (Lockheed via Jesse Lozano)

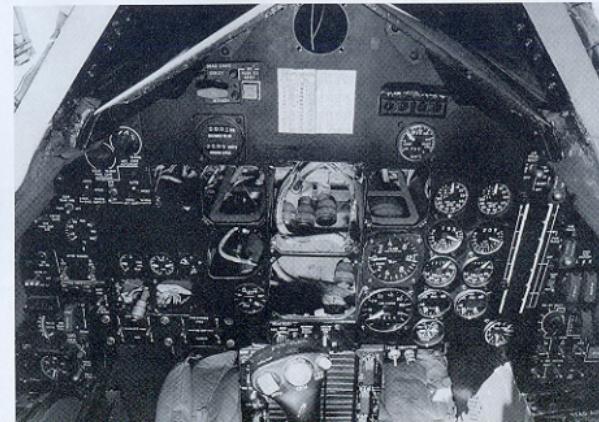


The early A-12 starboard cockpit console is similar to those fitted to operational A-12s. This console barely changed between the A-12 and the later SR-71. Blackbird cockpits were Dark Gull Gray (FS36231), with instrument black (FS27038) panel faces. (Lockheed via Jesse Lozano)



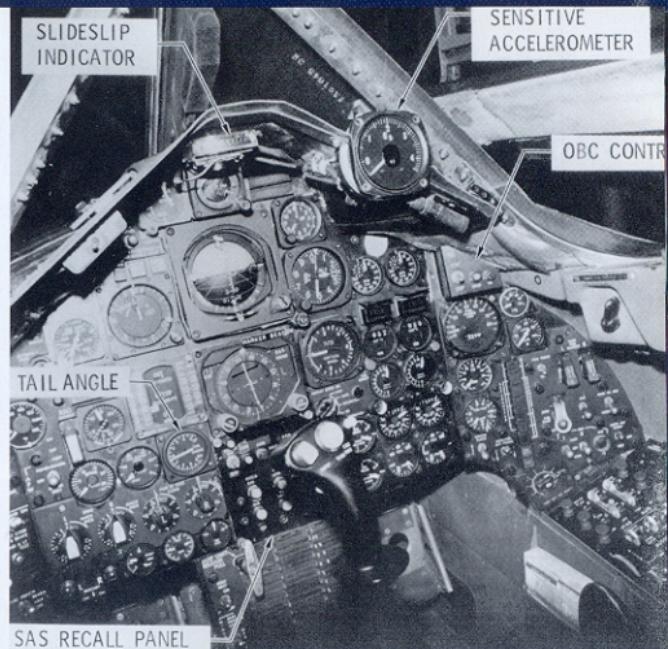
Rows of circuit breakers dominate the port cockpit console on the initial A-12. This Blackbird was not fitted with Electronic Countermeasures (ECM) equipment or camera systems. These items equipped operational A-12s. (Lockheed via Jesse Lozano)

Tony Landis and I recorded this image of the A-12B 'Titanium Goose' rear cockpit instrument panel in October of 1991. Before that time, there were no known images of the A-12B's aft instrument panel, which was used by the Instructor pilot. Most of the instruments were removed shortly after we took this photo. (Tony Landis)





Once the National Aeronautics and Space Administration (NASA) took over YF-12A flight operations in 1969, they removed all the instrumentation that was part of the YF-12 interceptor and not directly related to a flight test scenario. YF-12s used vertical tape instruments flanking the center instruments, instead of the standard round dials used on the A-12s and SR-71s. (Jay Miller)



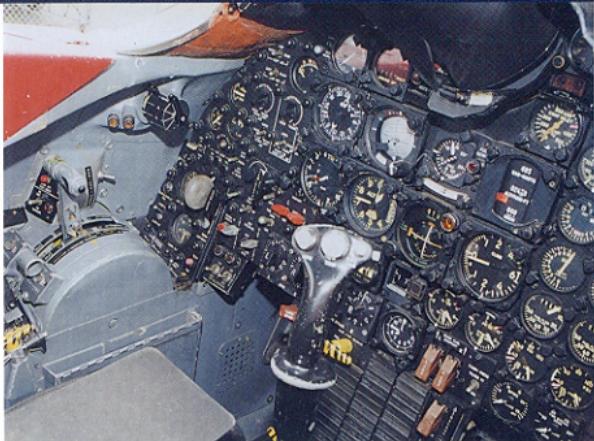
(Above) One SR-71A (2010/61-7959) was modified into the SR-71A/BT 'Big Tail' aircraft by late 1974. An eight-foot (2.4 m) long tail extension housed various sensors and reconnaissance equipment. The pilot's instrument panel featured several non-standard instruments, which are highlighted in the photograph. For example, the tail angle instrument on the port side indicated the enlarged tail cone's angle, which the pilot adjusted to ground clearance on take-off and landing. (Lockheed via Tony Landis)

(Left) Unique instruments for the SR-71A/BT 'Big Tail' were mounted on the main instrument console's port side. Only five or six crews flew the 'Big Tail,' including Col Tom Pugh, former commander of the 9th Strategic Reconnaissance Wing (SRW). He was the first USAF pilot to fly the SR-71A/BT. The USAF cancelled the 'Big Tail' program in the fall of 1976. (Lockheed via Tony Landis)

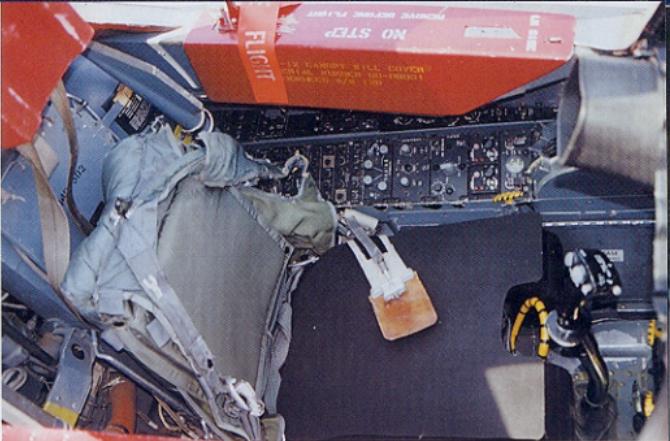


This is the typical instrument panel layout of an operational A-12. The scope in the panel's upper center is the periscope used to locate ground targets in order to start the camera operation. Most of the round dial gauges are off-the-shelf types per the mantra of A-12 designer Clarence L. 'Kelly' Johnson. His thought was, why invent something when you could save money by taking one that has already been designed and paid for. This held

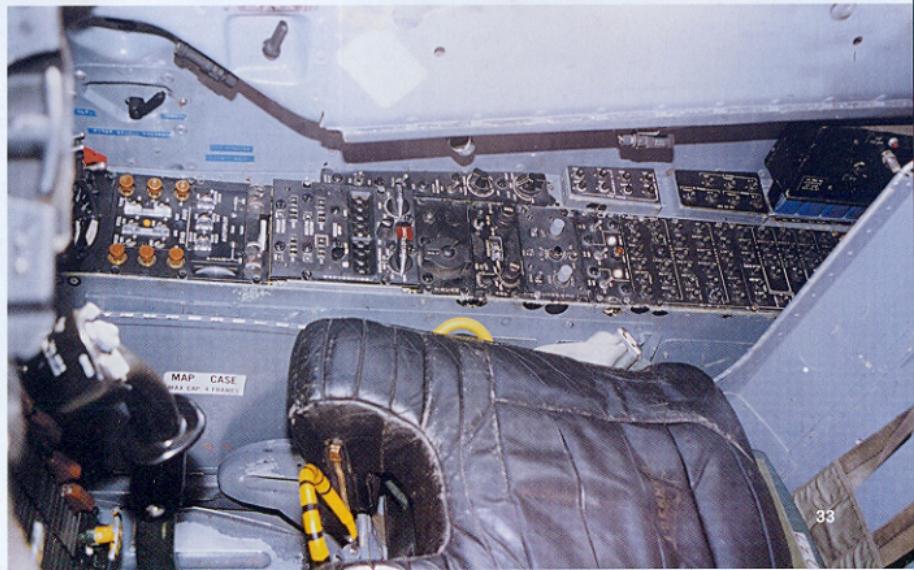
true for all but a few special instruments. The latter included the Triple Display Indicator (TDI) immediately below and to right of the viewing scope. The inlet control and positioning gauges are located along the bottom of the panel's left side, while a clock was mounted to the right of these gauges. (Author)



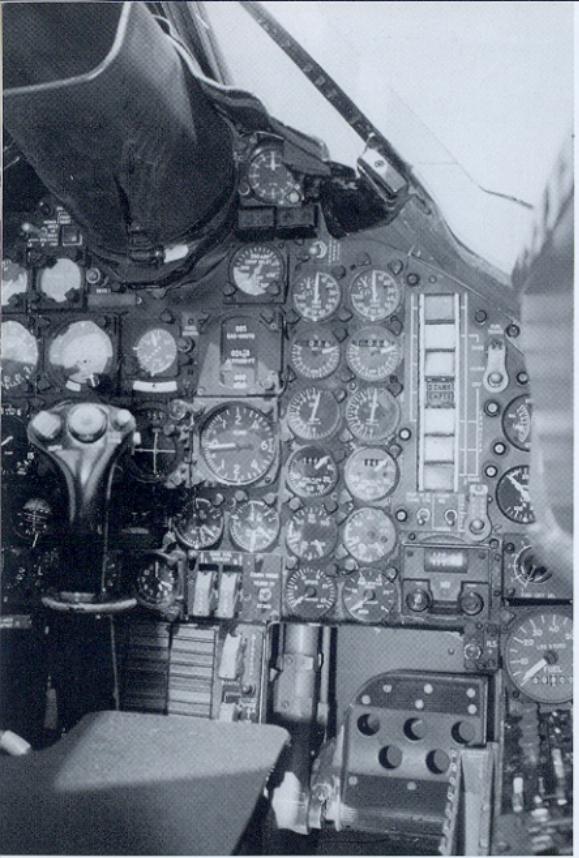
(Above) The throttle quadrant is mounted on the A-12's port cockpit console, immediately aft of the instrument panel. The cockpit is painted overall Dark Gull Gray, with satin Instrument Black panel faces. External illuminated gauges mounted on the A-12 gave off a yellowish-green hue. The later SR-71's gauges used internal lighting. (Author)



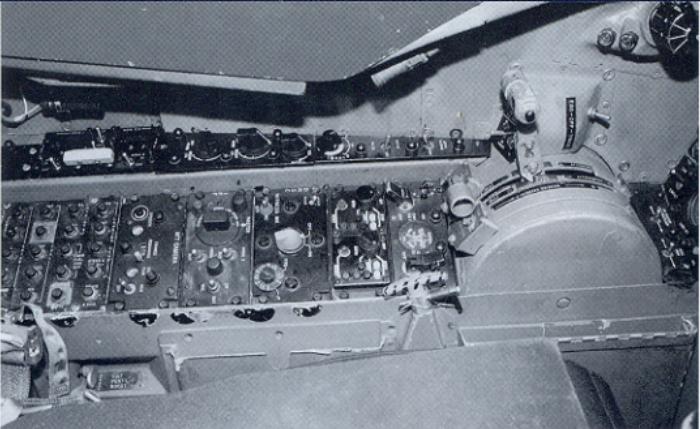
(Above Right) ECM and camera controls are located immediately aft of the throttle quadrant on the left instrument console. A red canopy sill cover is fitted to the port sill; another cover was provided for the starboard sill. (Author)



(Right) Several items of electronic equipment are controlled from the A-12's starboard cockpit console. These items included the autopilot, the Stability Augmentation System (SAS), Tactical Air Navigation (TACAN), and Automatic Direction Finder (ADF) panels. (Author)



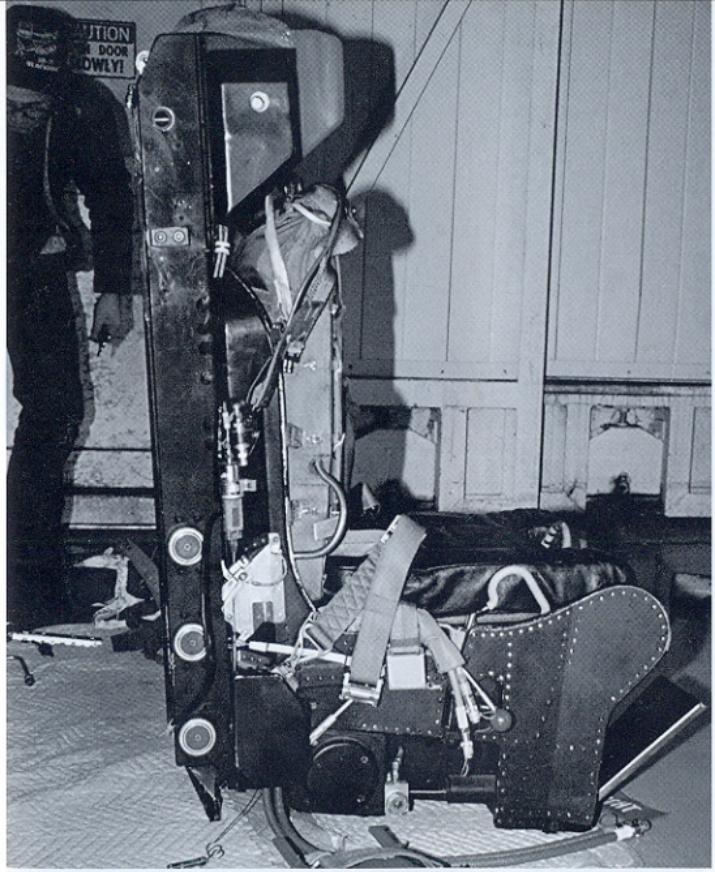
Pairs of engine operation and control gauges dominate the A-12 instrument panel's starboard side. The vertical row of square buttons allow the pilot to select read outs for each of the six fuel tanks. The master fuel flow gauge is mounted along the panel's lower right side, near the opening for the starboard rudder pedal. (Author)



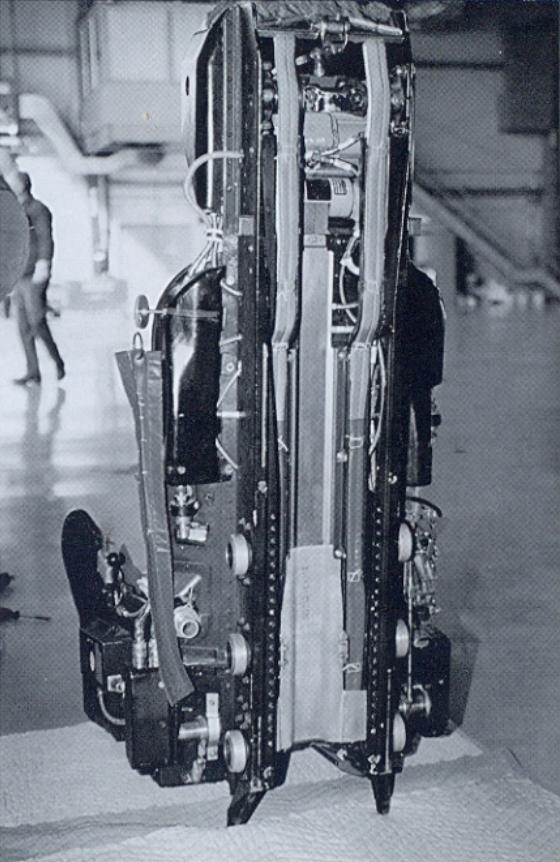
The Tri-Ethyl Borane (TEB) engine igniter counter is mounted immediately aft of the throttle quadrant on the port cockpit console. Other control panels located aft of the TEB panel are (from right): the cockpit oxygen system, Defensive Electronic (DEF)/ECM panel, the Ultra High Frequency (UHF) radio controls, the Identification Friend or Foe (IFF) panel, and the camera control panel. (Author)

The command 'Destroy' switch with a red safety cover is mounted on the lower right instrument panel, across from the master fuel control gauge. Frank Murray, one of the five surviving BLACK SHIELD pilots, described this switch as one used to arm the A-12's approximately 500 pounds (227 kg) of explosive cord that was installed on all BLACK SHIELD A-12 flights. If one were to be lost on take off, or had to land at an unfriendly airfield, you didn't want the program compromised. To prevent this, the pilot would set the switch to either go immediately or with a four to six second delay before detonation! (Author)





The Blackbirds were fitted with the rocket-powered Lockheed SR-1 seat, which the firm later called the F-1 Stabilized Ejection Seat. This seat was modified from the Lockheed C-2 seat fitted to the company's F-104 Starfighters from the late 1950s. The SR-71 ejection seat is painted overall satin black with a red headrest and gray-green (approximately FS24373) seat back upholstery and belts. (Tony Landis)

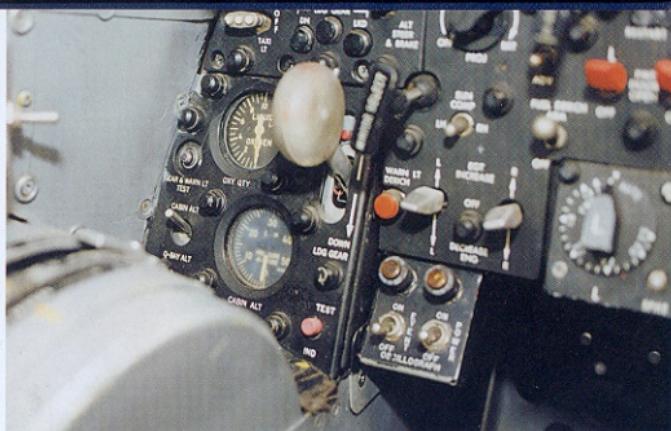


Three pairs of rollers are mounted along the outboard rails on the SR-1 ejection seat's aft section. These rollers fit into rails mounted in the Blackbird's cockpit. The SR-1 (later called the F-1) was a "zero-zero" seat, capable of safely ejecting its occupant at zero airspeed and zero altitude; i.e., from a stationary aircraft on the ramp. (Tony Landis)



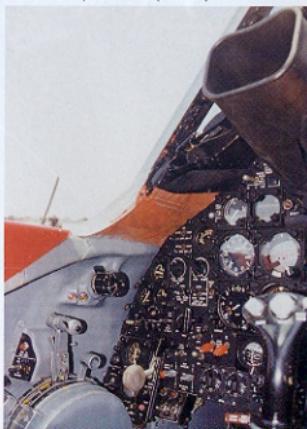
Various hoses and cables adorn the SR-1 (F-1) ejection seat fitted to the Blackbirds. Red flags marked REMOVE BEFORE FLIGHT are attached to safety pins, which are pulled just before takeoff and reinserted just after landing. The pilot automatically separated from this seat after ejection; both came down to earth on their own parachutes. (Tony Landis)

36



The round-handled landing gear control lever protrudes from the left side of the A-12's instrument panel. Near this lever are the cockpit environmental control panel, the cockpit altitude gauge, and the cockpit oxygen quantity indicator. (Author)

The periscope for viewing the terrain below the aircraft is viewed through a dark gray tube. This tube kept out sunlight that would interfere with the pilot's view. Various flight and navigation instruments dominate the port instrument panel half. (Author)



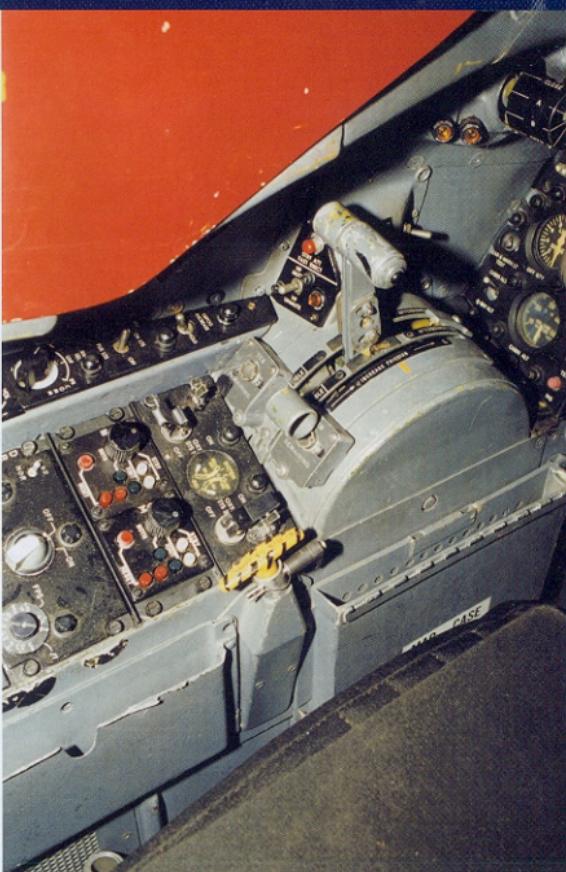
The A-12's control stick is standard on all Blackbird models. This stick type was previously used on the Convair B-58A Hustler strategic bomber. The three buttons on the stick are (from left): microphone switch, elevon trim switch, and Nose Wheel Steering (NWS) actuator button. (Author)





Three yellow and black emergency handles are fitted to the lower instrument panel, which contains master warning lights. The upper handle releases the surface limiter that restricted control surface movements under certain flight conditions, while the lower right handle is the emergency landing gear release. The purpose of the lower left handle is unknown. The yellow and black handle on the seat front activates the ejection seat. (Author)

Circuit breakers for various systems are mounted on the port instrument console's aft section. Communications breakers are at the far aft end, followed by those for the pitch, yaw, and roll controls and breakers for the engine and inlet controls. Immediately in front of the circuit breakers is the camera control section panel, which allowed the A-12 pilot to choose the camera in use over a particular area of interest. (Author)



The throttle levers were designed so the pilot could move both levers simultaneously or each one individually as required. Aft of the throttle quadrant are the TEB indicator, the cockpit oxygen flow indicator, and the early model A-12 operational, two channel, ECM control panel. (Author)



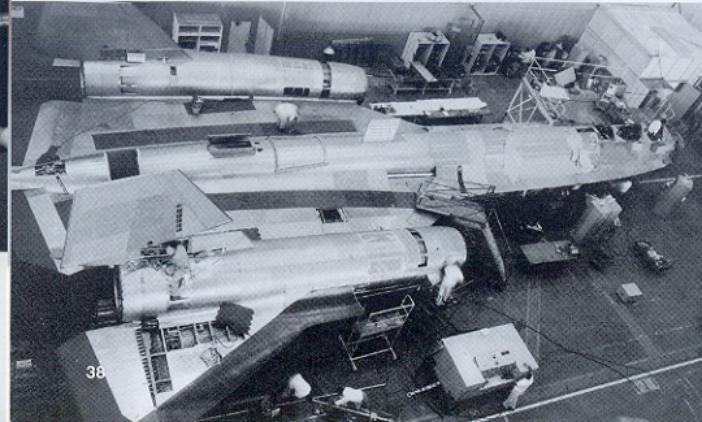
The first YF-12A (1001/60-6934) sits on the ramp at 'Area 51' (Groom Dry Lake, Nevada), with all of the associated ground support equipment and flight test instruments. Lockheed was ordered to airbrush out the hills in the background so those of us who are uninformed would not know that this photo was taken at Area 51! (Lockheed via Tony Landis)

The second YF-12A (1002/60-6935) undergoes construction in the cordoned-off area of the Lockheed Skunk Works, building 309/310, in Burbank, California. Only those workers with a 'need-to-know' were allowed into this section of the factory. (Author's Collection)



Ground support equipment are gathered near the first YF-12A on the north ramp of the 'Area 51' test facility. The dry lakebed and the Groom Range are visible in the distance. (Author's Collection)

A YF-12A's two-man flight crew prepares for a test mission. They are wearing the David Clark Company S-901 pressure suit, which was in silver color. This same suit was worn by A-12 pilots. A hose connects the suit to a portable air conditioning unit that keeps the crew from cooking in their suits. (Author's Collection)





Infrared (IR) seekers are on the YF-12A's forward fuselage chines. Cameras fitted inside streamlined pods mounted under the nacelles took 16mm movies of AIM-47 missile launches. These cameras recorded the effects of Mach 3 on various equipment during later tests. (Marty Isham Collection)

Lockheed and Hughes flight-test technicians check out a YF-12A prior to a flight. Cockpit interiors and canopy inner surfaces were both painted Dark Gull Gray on all Blackbirds. The later SR-71 employed the same windshield and canopies as the YF-12A. (Author's Collection)

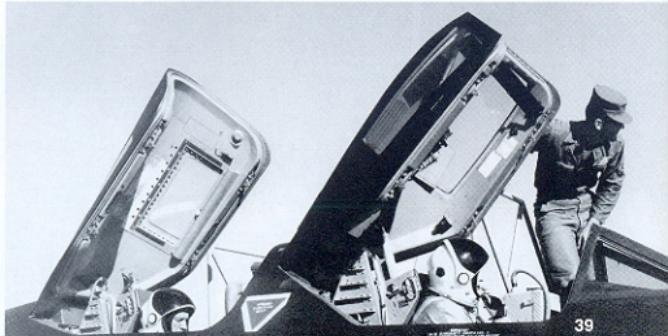
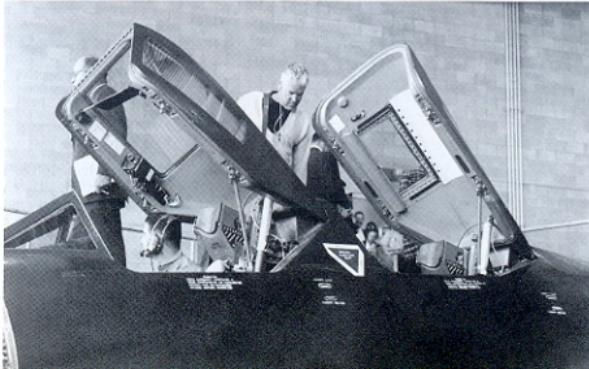


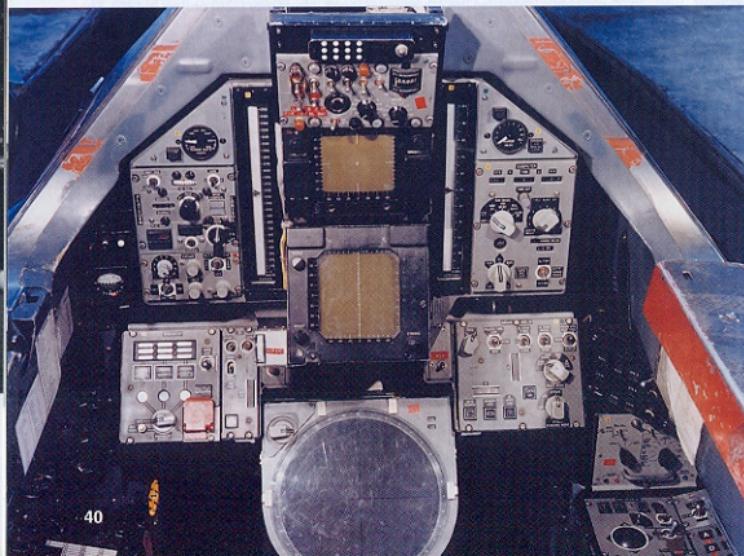
NASA added this pitot tube to their two YF-12As. This tube was mounted just behind the radome at the 10 o'clock and 2 o'clock positions. Beneath the pitot tube is a vent for cooling the test equipment located aft of the radome. (Author's Collection)



NASA fitted at least one of their two YF-12As with this highly complex looking pitot tube. Vanes at the tube's base were used to evaluate airframe flexing at high mach numbers in turbulent air. There are no photos of this test probe in flight. The USAF passed the second (1002/60-6935) and third (1003/60-6936) YF-12As to NASA after the Pentagon cancelled the Advanced Manned Interceptor (AMI) project in 1968. The third YF-12A ('936) crashed while on a NASA test flight in 1971, but the second aircraft survived and was retired to the USAF Museum at Wright-Patterson AFB, Ohio in 1979. (NASA via Tony Landis)

The Pilot (front cockpit) and Fire Control Officer (FCO; aft cockpit) make last minute checks prior to a YF-12A test flight. These canopies lacked the window sunshades and pilot's rear-looking periscope retrofitted to later SR-71 canopies. The ejection seat warning triangle between the canopies is red and white. (Marty Isham Collection)





(Above Left) The pilot's cockpit on operational YF-12As differed in several details from those of A-12s. The target periscope atop the instrument panel was removed and replaced by a radarscope topped by the standby compass. Engine inlet temperature and pressure gauges flank the radarscope. Two vertical tape instruments – a speed indicator to port, an altimeter to starboard – flank the artificial horizon on the panel's center. The speed indicator presented the YF-12A's speed in both Mach numbers (left of display) and knots (right of display). (Lockheed via Tony Landis)

(Above) NASA modified the pilot's cockpit on their two YF-12As. They removed all of the weapons related instrumentation, which were replaced – in some cases – with flight test dedicated hardware. This included installed test equipment in place of the radarscope on the panel's upper center section. Additional testing controls were mounted along the instrument panel's starboard side. (Lockheed via Tony Landis)

(Left) The Fire Control Officer (FCO) sat in the YF-12A's aft cockpit. Controls for the Hughes AN/ASG-18 fire control system and the three Hughes AIM-47A semi-active radar homing air-to-air missiles are mounted along the panel's left side. Each AIM-47A – carried within the lower fuselage weapons bay – had a nuclear warhead with a yield up to 250 kilotons (kt) of TNT. Two map displays and a round radar scope dominate the center column of the instrument panel. Controls for both the fire control computer and the AN/ASG-18 radar are mounted on the panel's starboard side. No flying controls were fitted to the YF-12A's aft cockpit. (Lockheed via Tony Landis)

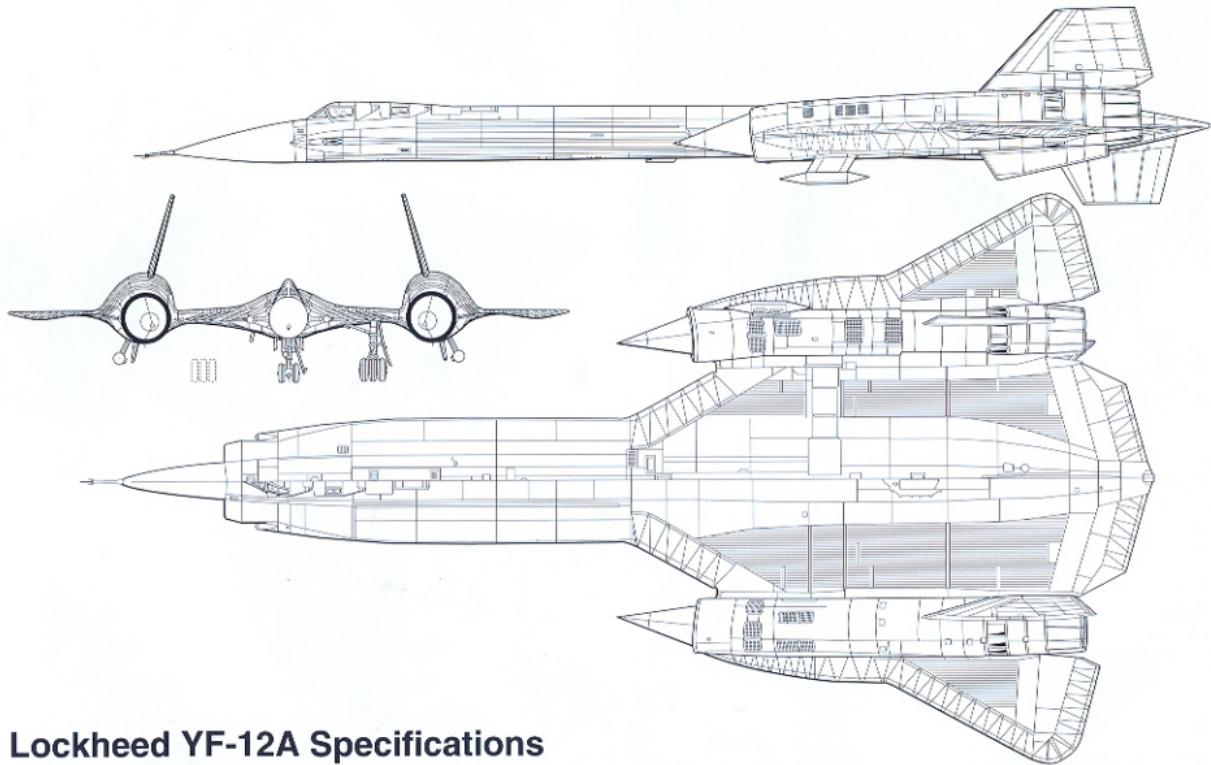


The initial YF-12A (1001/60-6934) undergoes pre-flight checks at Edwards AFB, California during the Advanced Manned Interceptor (AMI) test program. The Air Force Systems Command (AFSC) insignia is painted under the tail number 06934 on the starboard vertical tail. The Air Defense Command (ADC) emblem was painted on the port tail. This scheme was used while the YF-12A was under consideration for production. (Marty Isham Collection)

The second YF-12A (1002/60-6931) flies with extended landing gear during a NASA test flight. White photo calibration markings are painted along the engine nacelle sides and on the lower port wing. The wing calibration insignia comprised a vertical cross within a circle. NASA is black on the flat Orange-Yellow (FS35358) tail band, while the Outstanding Unit Award ribbon appears above the tail number 06935. (Author's Collection)



The third YF-12A (1003/60-6936) flies above the Sierra Nevada mountains during a flight from Edwards AFB. This Blackbird suffered a massive in-flight fuel line rupture that resulted in a sizable fire during a NASA test flight on 24 July 1971. Both the YF-12A's pilot, Lt Col Jack Layton, and the FCO, Maj Billy Curtis, safely ejected from the crippled aircraft. The YF-12A crashed nose-first just off of California Highway 58 at the north end of Edwards. (Author's Collection)



Lockheed YF-12A Specifications

Wingspan:.....56 feet 7.4 inches (17.3 m)

Length:.....101 feet 8 inches (31 m)

Height:.....18 feet 4 inches (5.6 m)

Empty Weight:.....68,000 pounds (30,845 kg)

Maximum Weight:.....124,000 pounds (56,246 kg)

Powerplant:.....Two 34,000 pound thrust Pratt & Whitney JT11D-20 (J-58) afterburning turbo-ramjet engines

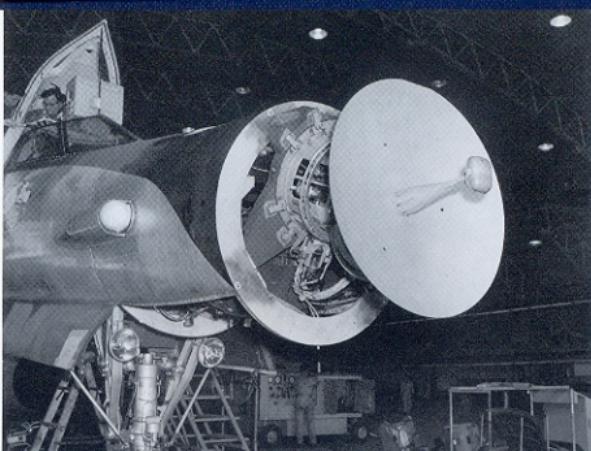
Armament (Proposed): Three Hughes AIM-47A Air-to-Air Missiles, each with up to a 250 kiloton nuclear warhead.

Maximum Speed:.....Mach 3.24 – 2185 MPH (3516 KMH) at 80,000 feet (24,384 m)

Maximum Altitude:.....85,000 feet (25,908 m)

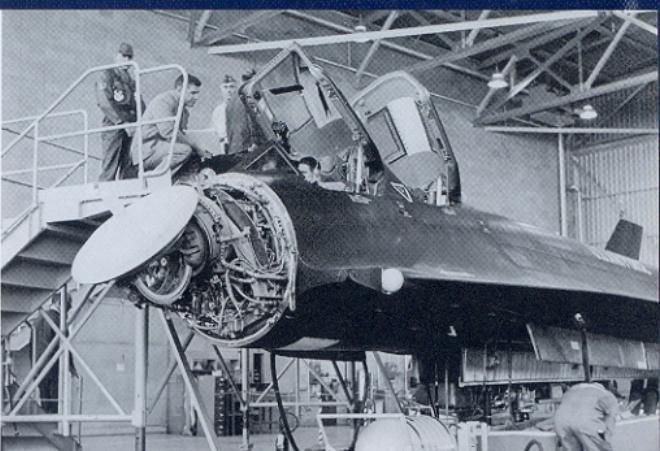
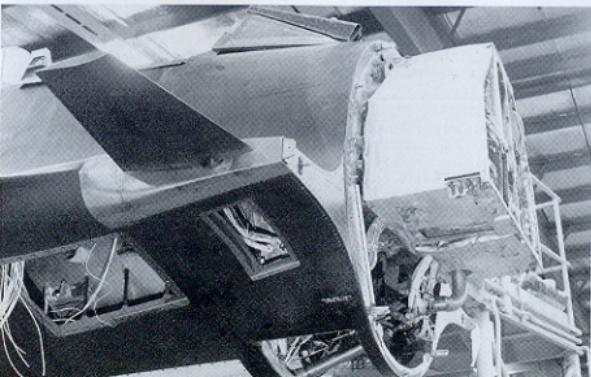
Range (Unrefueled):.....3200 miles (5150 km)

Crew:.....Two



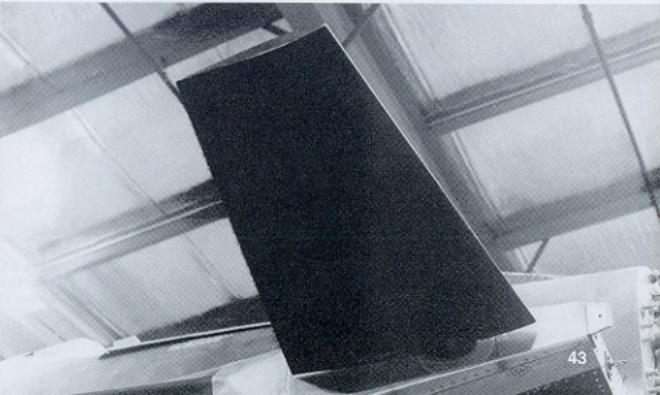
The YF-12A's Hughes AN/ASG-18 Fire Control System was first flown on a modified YB-58A Hustler (55-665) in early 1960. This testbed was exclusively flown by then Lockheed/Hughes Test Pilot, Jim Eastham. He had the distinction of flying an A-12 at 'Area 51' on Mondays, flying the YB-58A at Edwards on Wednesdays and on Fridays, and the Lockheed F-104A assigned to Lockheed's Palmdale facility for flight proficiency. Tough job, but someone had to do it. (Author's Collection)

The AN/ASG-18 Fire Control system and related radar was removed from both YF-12As assigned to NASA after completion of the AMI flight test program. This aircraft was fitted with a NASA Flight Dynamics Lab sponsored experiment to evaluate canards. These surfaces were used to reduce airframe stress and flex in flight. (NASA via Tony Landis)



The YF-12A's radome is removed to reveal the 40-inch (101.6 cm) diameter AN/ASG-18 Pulse Doppler Fire Control System radar antenna. This radar was capable of tracking targets up to 100 miles (161 km) from the interceptor. Although the YF-12A never went into production, the AN/ASG-18/AIM-47 led directly to the AIM-54 Phoenix Fleet Defense System fitted to the US Navy's F-14 Tomcat. (Author's Collection)

The NASA YF-12A's chine-mounted canards were placed in the same location as the Infra-Red (IR) sensors. There are no in-flight photos showing a YF-12A with these canards, and no firm indication that the Blackbird ever flew with these surfaces. (NASA via Tony Landis)





(Above Left) On 29 February 1964, the US Air Force – in a public announcement by President Lyndon B. Johnson – admitted the Blackbird's existence with this first publicly released view of the initial YF-12A (1001/60-6934). The press had no idea of how the engines were attached to the wing and had to speculate on the wing platform, and had no idea of the aircraft's physical dimensions. It wasn't until September of 1964 that several journalists taken out to the Edwards AFB flight line viewed the YF-12A for the first time. They could not take any note pads or cameras and could ask no questions as to the aircraft's real potential. (Author's Collection)

(Above) The second YF-12A (1002/60-6935) is parked on the west edge of Rogers Dry Lake, Edwards AFB. NASA used this Blackbird to conduct high speed flight tests. A close look reveals the removed aft canopy from this Blackbird. The Air Force Outstanding Unit Award ribbon is painted on the upper vertical tail, above the Flat Insignia White (FS37875) tail number (06935). This award was presented to the USAF's YF-12A flight test team in 1968. Immediately below the tail number is a flat Orange-Yellow and flat Black NASA tail-band. (NASA via Tony Landis)

(Above Left) After setting three world records in 1965, the third YF-12A (1003/60-6936) sported three YF-12 silhouettes on its nose. Each silhouette has the particular record – absolute altitude, absolute speed over a straight course, and absolute speed over a closed course – stenciled on it. The Hughes AIM-47A air-to-air missile displayed beside the aircraft was developed into the AIM-54 Phoenix for the US Navy's F-14 Tomcat. (Author's Collection)

(Left) The ADC insignia is painted on the port vertical tail of the first YF-12A during the AMI program tests. There are no images of this badge being photographed after a Mach 3 flight and it is assumed that the full color shield either burnt off on its first flight or came off as the YF-12A approached its design speed. This was probably the only time that this YF-12A displayed the ADC emblem. (Marty Isham Collection)



The original all-silver David Clark Company S-901 pressure suit was extensively used by OXCART/A-12 flight crews. It was also used by YF-12A and early SR-71 crews during the 1960s. The suit is hooked up to a portable air conditioner unit. (Author's Collection)

David Clark modified the S-901 into the S-970 with an all-white finish in the late 1960s. White was chosen to reduce the glare in the cockpit at high altitudes. The dark brown S-901J suit was used for some time, but it was replaced with the S-1030 light gold suit in the early 1980s. (Author's Collection)



An SR-71 crewman wearing the standard David Clark S-1031A 'Gold Suit' stands beside a colleague wearing the Air Force blue suit. The latter garment has only been seen at the former SR-71 flight test and overhaul facility at Site 2, Air Force Plant 42 in Palmdale, California. S-1031A suits are also worn by Lockheed U-2 reconnaissance pilots and by Space Shuttle astronauts. (Author's Collection)

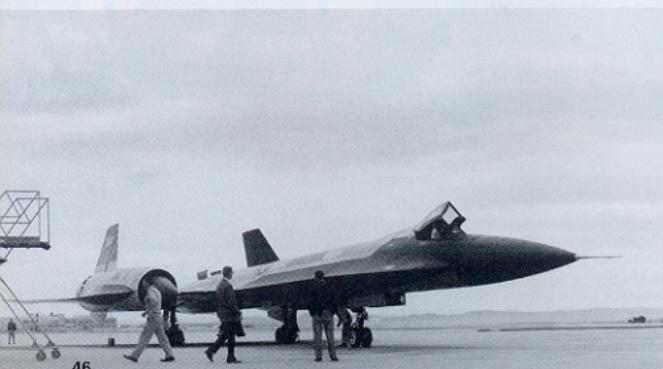


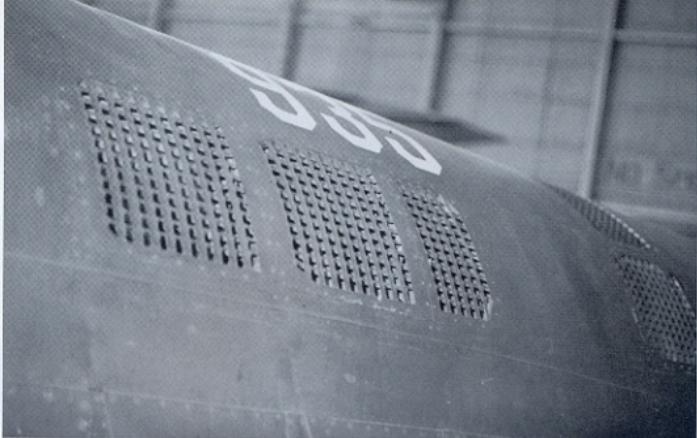
The first YF-12A (1001/60-6934) sits on the run-up pad to the south of Groom Dry Lake, Nevada. The aircraft is in natural metal, with Flat Black (FS37038) only on the radome, engine inlet spikes, and the chine and wing edges. Black paint covered those airframe sections that used high temperature polymer composites, which are Radar-Absorbent

The third and final YF-12A (1003/60-6936) is prepared for a test flight from Groom Dry Lake. Jim Eastham is at the controls on this test mission. The brake parachute doors are open on the upper aft fuselage. (Lockheed via Tony Landis)

Materials (RAMs). This was the original YF-12A scheme until the aircraft were repainted overall Black in February of 1964. IR sensors have not yet been installed in the forward fuselage. YF-12As used metal vertical stabilizers, instead of the composite stabilizers used on the A-12s. (Author's Collection)

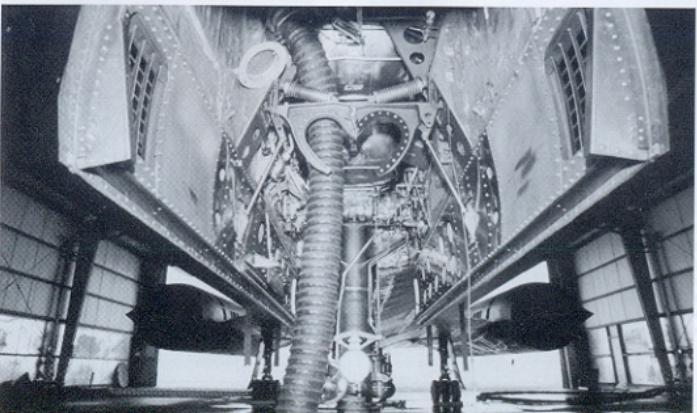
Two SR-71As undergo major overhaul at Lockheed's Blackbird overhaul facility, Site 2, Air Force Plant 42 in Palmdale. Skin panels have been removed from the port inner wing assembly, revealing the multi-spar construction. Corrugated wing surfaces accommodated varying rates of airframe heating and cooling. There is little or no difference between the YF-12 and the SR-71 in the wing and engine nacelle assembly area. (Author's Collection)



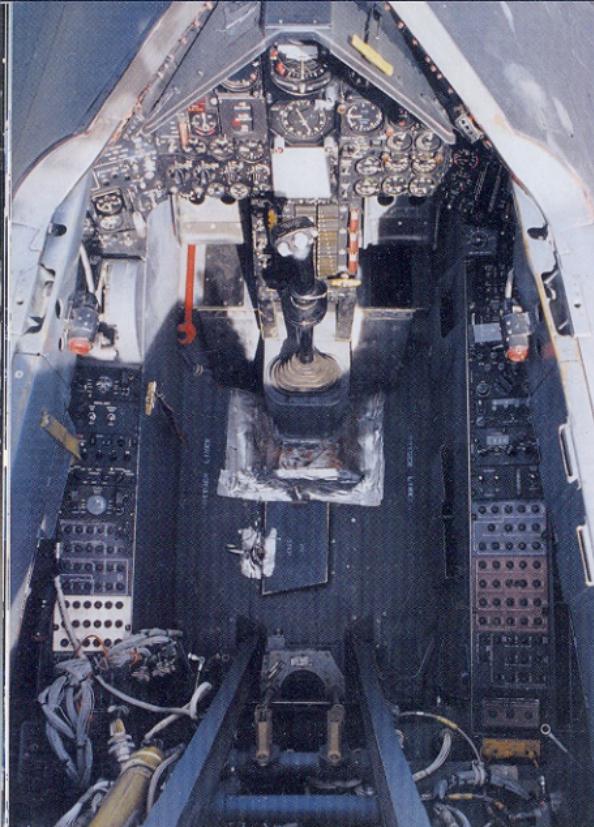


Inlet/engine bleed air grills are flush-mounted on the YF-12A's outboard engine nacelle surfaces. Excess air pressure inside the inlet was bled through these grills and through free-floating bypass doors. These bleed air grills are common on all Blackbirds. (Author)

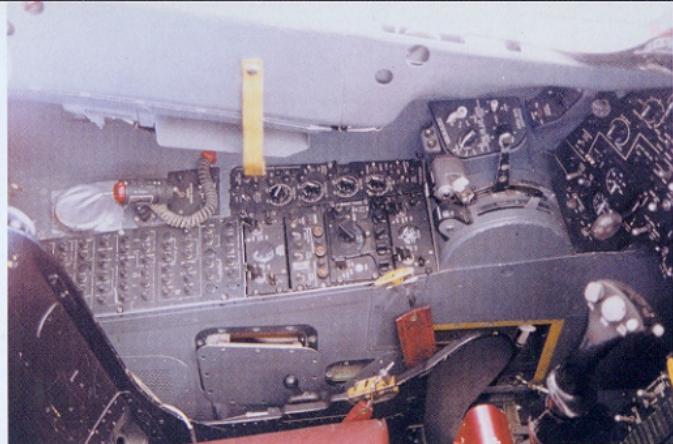
The SR-71 nose landing gear bay differed in only slight details from that of the earlier A-12 and YF-12 Blackbirds. The black ribbed hose coming through the bay is used for cockpit and equipment cooling. A tremendous amount of low-flash JP-7 fuel has leaked from the Blackbird's integral fuel tanks to the hangar floor. When the SR-71 sat on the ground for some time, up to 60 drops of fuel per minute leaked from each of its fuel tanks. (Author)



A grounding strap fitted between the SR-71's nose gear tires prevents electrical surges from damaging equipment. The upper drag link holder – the keyhole looking item hanging by a thin cable – is used when the drag link is disconnected for towing. This Blackbird's nose wheels are painted flat black. (Author)

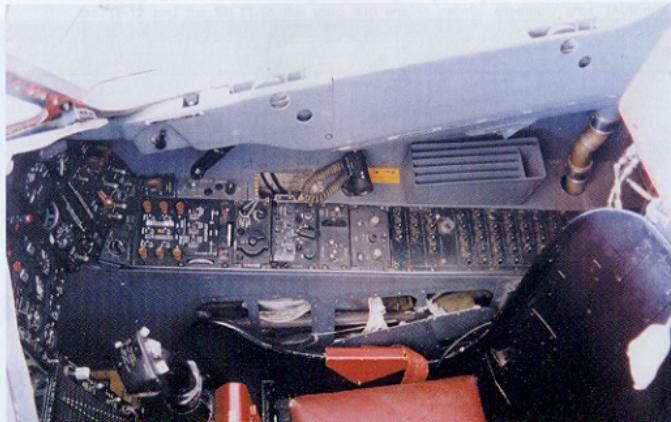


The F-1 ejection seat is removed from the front cockpit of the 21st SR-71A (2023/61-7972) built. This photograph was taken days after this Blackbird set a transcontinental speed record on its last flight on 6 March 1990. It flew from Los Angeles to Washington, DC in 1 hour 7 minutes 53.4 seconds. This SR-71A is now displayed at the Stephen F. Udvar-Hazy Center of the Smithsonian's National Air and Space Museum, located at Washington Dulles International Airport (IAP) in Sterling, Virginia. This center opened to the public in December of 2003. (Tony Landis)



The SR-71 pilot's left cockpit console had few changes from those of the earlier A-12 and YF-12 Blackbirds. A utility light is attached by a coiled cord to the console. The ejection seat has not yet been removed from the Smithsonian's record-setting aircraft ('972). (Tony Landis)

Few changes from earlier Blackbirds were made to the SR-71 pilot's starboard console. Autopilot controls are mounted on the console's forward edge, immediately aft of the instrument panel. Tony Landis had the honor of photographing the Blackbird's demilitarization process at its final resting place, Washington Dulles IAP. (Tony Landis)

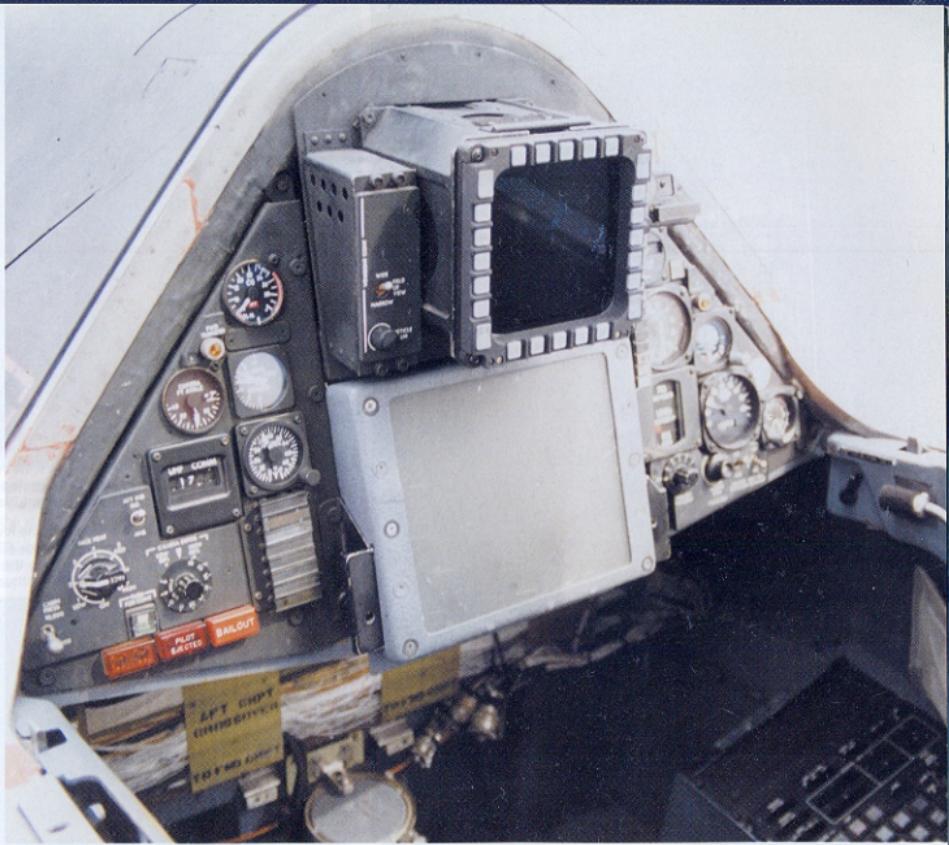




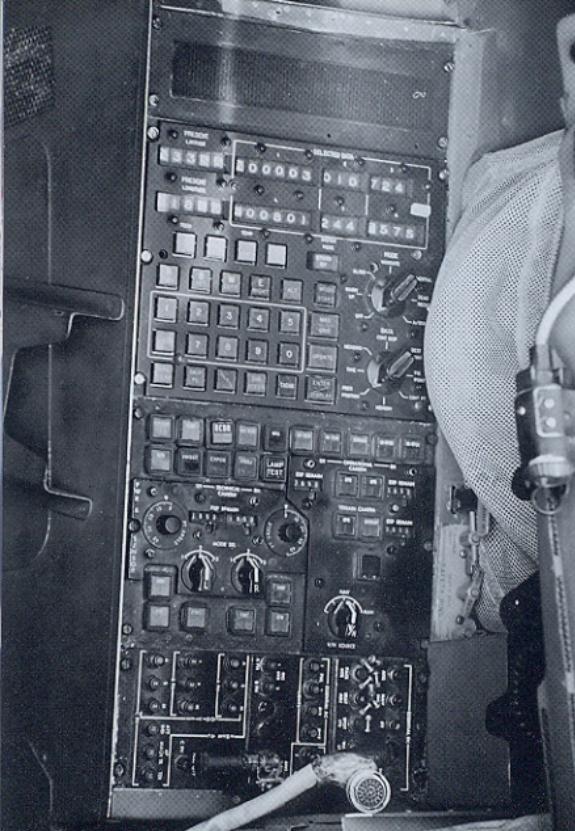
Controls for communications, Electronic Countermeasures/Defense (ECM/DEF), lighting, and oxygen are mounted on the aft cockpit's port console. The SR-71's Reconnaissance Systems Operator (RSO) performs many functions, including target acquisition, ECM, communications, and navigation duties. (Tony Landis)



(Left) The radar control panel is on the forward section of the RSO's starboard console. This panel is followed by those for navigation control and display, and for power and sensor controls. (Tony Landis)



(Above) The RSO's instrument panel contains a number of significant items. The view display in the top center section was used to find the waypoints for navigation and Inertial Navigation System (INS) updates. It was also used to locate the target to be photographed, scanned, or monitored. The moving map projector below the view sight shows the RSO where the SR-71 is in relationship to ground targets. Sensor gauges are mounted to port and navigation instruments to starboard. (Tony Landis)



The RSO's right cockpit console is comprised of three panels. The radar control panel at the top (closest to the instrument panel) adjusts the nose-mounted synthetic aperture radar used for long-range sensing. Inputs and adjustments to the INS are made using the navigation control and display panel. The power and sensor control panel for the Blackbird is at the bottom (furthest from the instrument panel). (Tony Landis)



The two-panel windshield above the SR-71A's instrument panel gives little forward view for the pilot. Conventional round gauges were used, dispensing with the YF-12's vertical tape instruments. SR-71 instrument panels were painted satin Instrument Black (FS27038). (Tony Landis)

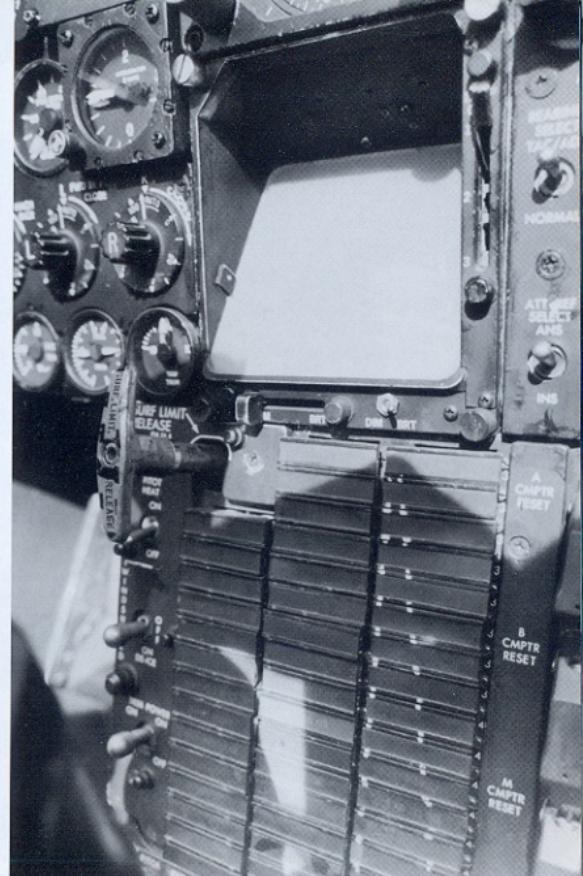
Engine inlet spike controls are mounted along the lower port edge of the SR-71 pilot's instrument panel. The Lockheed-designed Triple Display Indicator (TDI) is mounted immediately left of the Horizontal Situation Indicator (HSI). The TDI was unique to the Blackbirds and conveniently indicated to the pilot (from top) Knots Estimated Air Speed (KEAS), altitude, and the calculated Mach number. (Tony Landis)





The instrument panel's center column features (from top) the attitude direction indicator, the HSI, and the map projector. The latter instrument displays the SR-71's pre-planned route and navigational waypoints, which were loaded on a film strip prior to the mission. (Tony Landis)

The Vertical Speed Indicator (VSI) is mounted to starboard of the HSI in the SR-71's front cockpit. The altimeter is located immediately above the VSI, while primary engine control and fuel status gauges are placed to the right and below the VSI. (Tony Landis)



The map projector is mounted on the center column of the SR-71 pilot's instrument panel. Immediately below this display is the pilot's annunciator panel. If and when the Blackbird has a system malfunction, one of the many indicators will illuminate to inform the pilot of a potential or real problem. (Tony Landis)



During the mid-1960s, the SR-71 production line was located in building 309/310 of Lockheed's Advanced Development Projects (Skunk Works) in Burbank, California. This facility has since been torn down and the Skunk Works relocated to Plant 10, Air Force Plant 42 in Palmdale, California. Blackbirds under construction are (from front): three SR-71As (2004/61-7953, 2005/61-7954, and 2006/61-7955) and two SR-71B trainers (2007/61-7956 and 2008/61-7957). (Lockheed via Buddy L. Brown)



Construction continues on the five SR-71s shown in the previous photograph. The yellow sign atop the work shack to the left reads IT'S SERIOUS WATCH OUT FOR FOD (Foreign Object Damage). This warned workers against leaving tools, screws, and other objects that could damage the aircraft. (Lockheed via Author's Collection)

Lockheed workers mate the forward and aft fuselage sections of the first SR-71A (2001/61-7950) in 1964. This manufacturing break is usually called the 715 splice, which referred to Fuselage Station (FS) 715, or 715 inches (1816 cm) from the tip of the nose to the break point. FS usage is the standard measurement used on all aircraft. (Lockheed via Buddy L. Brown)





Lockheed chief SR-71 test pilot Bob Gilliland flew the initial SR-71A (2001/61-7950) on its maiden flight on 23 December 1964. Gilliland had the honor of flying six of the eight Blackbird versions. The two exceptions were the M/D-21 Mother/Daughter drone launch Blackbird and the SR-71A/BT 'Big Tail' version. (Author's Collection)

The second SR-71A (2002/61-7951) taxis after landing at Edwards AFB. The USAF assigned this Blackbird to NASA in 1971 to replace the third YF-12A (1003/60-6936), which had crashed that year. The USAF deleted all sensitive electronic and reconnaissance equipment from this SR-71A and – not wanting the world to know that NASA was flying the world's premier spy plane – redesignated it the YF-12C. It flew with a bogus serial number (60-6937), which was assigned to an operational A-12. (NASA via Tony Landis)



The first SR-71A's initial flight originated from Palmdale, California, where all subsequent SR-71s made their first flights. Gilliland's first flight lasted just over one hour and the Blackbird reached just over 1000 MPH (1609 KM) before safely landing at Palmdale. (Author's Collection)

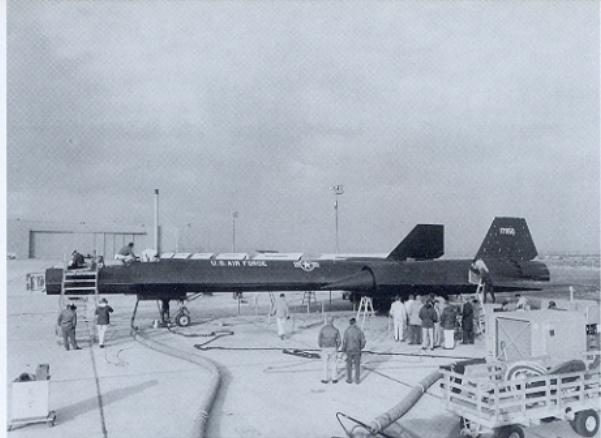
The sole YF-12C, formerly the second SR-71A (2002/61-7951) makes a NASA test flight from Edwards AFB. The Orange-Yellow NASA tail band is painted under the spurious tail number 06937. At the end of its flying career in 1978, '951 was stored inside the main hangar at Lockheed's overhaul facility, Site 2, Air Force Plant 42 in Palmdale. Since 1991, this Blackbird has been on display at the Pima Air Museum in Tucson, Arizona. (Author's Collection)





Lockheed designed, built, and used two special trailers to move 50 Blackbirds from the Burbank factory to their final assembly points. The firm hauled 15 A-12s and three YF-12As to Groom Dry Lake ('Area 51') and 32 SR-71s to Site 2 at Palmdale. The trip to Area 51 took approximately two and one half days. (Author's Collection)

Two fuel trucks are parked by the starboard side of the first SR-71A prior to its first flight on 23 December 1964. The Blackbird's fuselage juts into the main hangar at Site 2. The right outboard wing is folded up for J-58 engine installation. (Author's Collection)



The initial SR-71A (2001/61-7950) was reassembled at Site 2 in Palmdale and readied for its first flight. The nose section was removed and flight test instrumentation loaded inside this space. All SR-71s were painted overall Flat Black (FS37038), with full-color national insignia and Flat Insignia White (FS37875) markings. (Author's Collection)

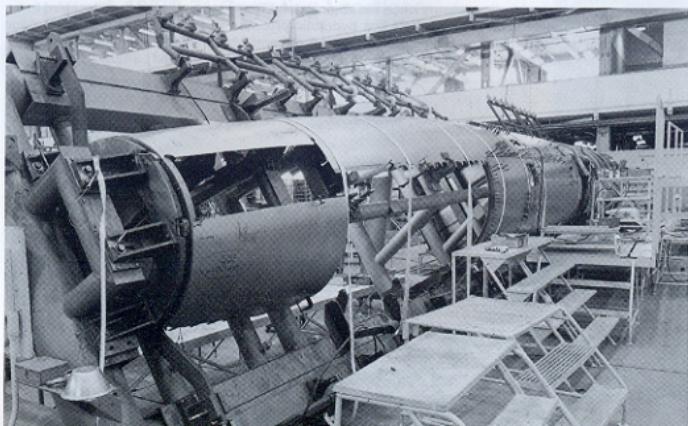
Lockheed technicians prepare the initial SR-71A for its first flight from Palmdale. Both outer wings are raised to allow for engine installation. The nose section has not been fitted to the forward fuselage, which juts into its hangar. (Author's Collection)





Three SR-71s are on the final production line at the Lockheed Skunk Works, which was located at the Hollywood-Burbank Airport. Composite radar absorbing materials along the airframe's edges slightly contrast in color with the largely titanium structure. (Author's Collection)

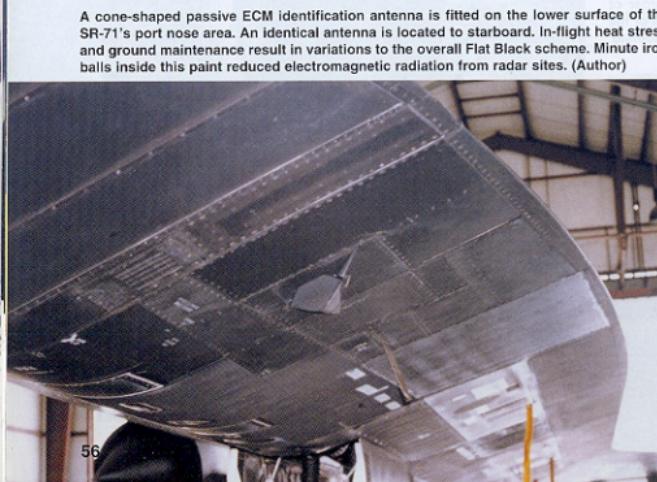
The number one SR-71A (2001/61-7950) aft fuselage undergoes assembly in the south corner of Lockheed's Burbank production facility. This section was nearly identical to the aft fuselages of the earlier A-12 and YF-12 aircraft, which allowed for commonality in production jigs and tooling. (Lockheed via Buddy L. Brown)



The forward fuselage of the fifth SR-71 (2005/61-7954) undergoes final assembly. Basic chine area construction was common to all Blackbirds and used close-pitched frames mounted to the fuselage sides. Composite skins were then bolted over these frames. Several workers are crouched in the two cockpit areas. (Lockheed via Buddy L. Brown)



Standard warning stencils are painted on the forward fuselage of this SR-71A. These markings are painted in red, white, and orange-yellow. These high-visibility stencils were replaced by low visibility red stenciled markings in the early 1980s. (Author)



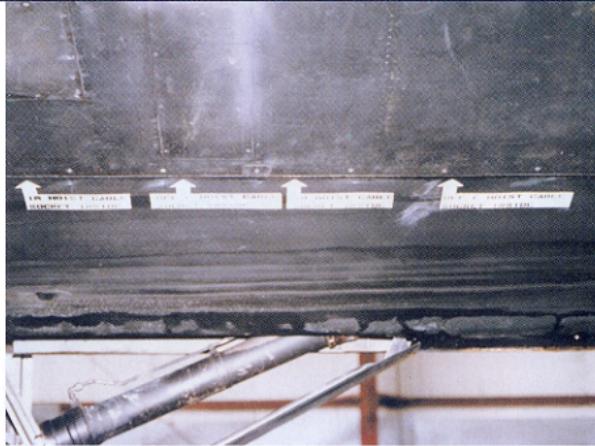
A cone-shaped passive ECM identification antenna is fitted on the lower surface of the SR-71's port nose area. An identical antenna is located to starboard. In-flight heat stress and ground maintenance result in variations to the overall Flat Black scheme. Minute iron balls inside this paint reduced electromagnetic radiation from radar sites. (Author)



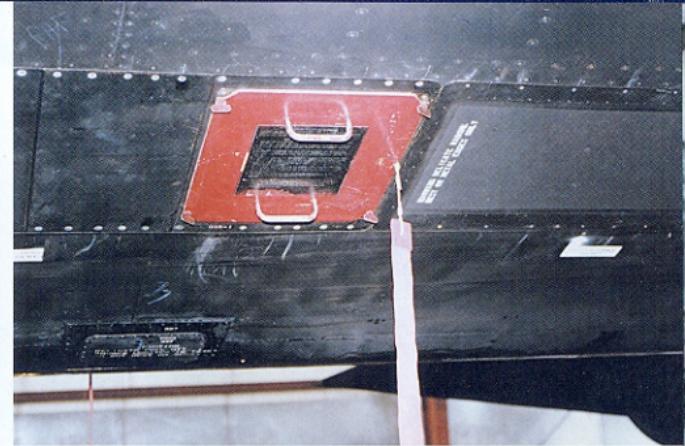
The retractable Ultra High Frequency (UHF) blade antenna on the port fuselage undersurface was common to both the SR-71s and the A-12s. The yellow oval just above this antenna is the emergency canopy jettison 'T' handle location. An eye-like marking immediately right of the RESCUE block locates the external canopy latch open/close point. (Author)

The in-flight refueling receptacle door is opened on this SR-71A. The receptacle is located on the upper fuselage, aft of the RSO's cockpit. This door normally closed flush through hydraulic pressure once the engines ran. The system allowed the Blackbird to be air-refueled even if the aircraft lost hydraulic pressure in flight, as the receptacle door would open once pressure was removed. A red and white rectangle around the receptacle highlighted its position to the tanker's boom operator ('boomer'). (Author)





A cover has been placed over the forward left mission bay ('K' bay) sensor windows. These covers were always installed whenever the SR-71 was on the ground and immediately after sensor equipment had been loaded. They protect the camera system's highly delicate optical windows. SR-71s carried mission equipment – either cameras or radar – in the nose compartment and eight fuselage compartments: four each port and starboard. (Author)



All SR-71 chine panels with heavy equipment attached to them have warning stencils painted on them. The white markings on this panel say **WARNING – HEAVY EQUIPMENT BEHIND THIS PANEL**. SR-71s carried sufficient film for their cameras to cover 1428 nautical miles (1644 miles/2646 km) of territory per mission. Sensors in the chine compartments were often employed while the Blackbird flew along the edge of hostile airspace. (Author)

A-12/SR-71 Operating Locations

Groom Dry Lake, Nevada ('Area 51,' 'The Ranch')

Lockheed/CIA A-12 Tests

Palmdale, California

Lockheed/USAF SR-71 Tests

Edwards AFB, California

USAF/NASA SR-71 Tests

Beale AFB, California

HQ, 9th Strategic

Kadena AB, Okinawa

Reconnaissance Wing (SRW)

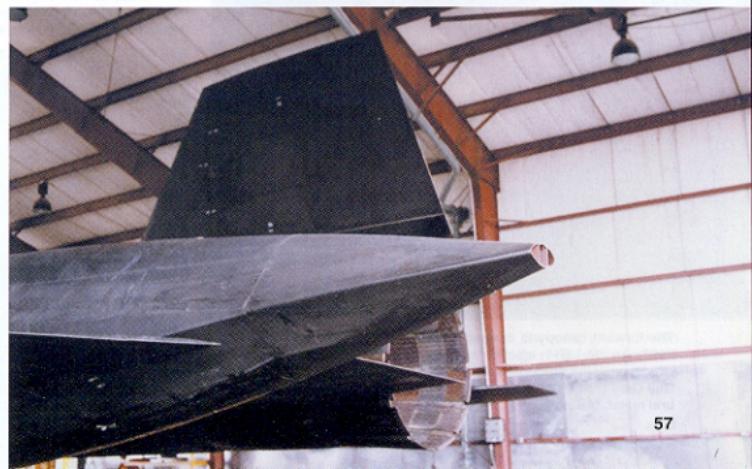
Det 1, 1129th Special Activities

RAF Mildenhall, England

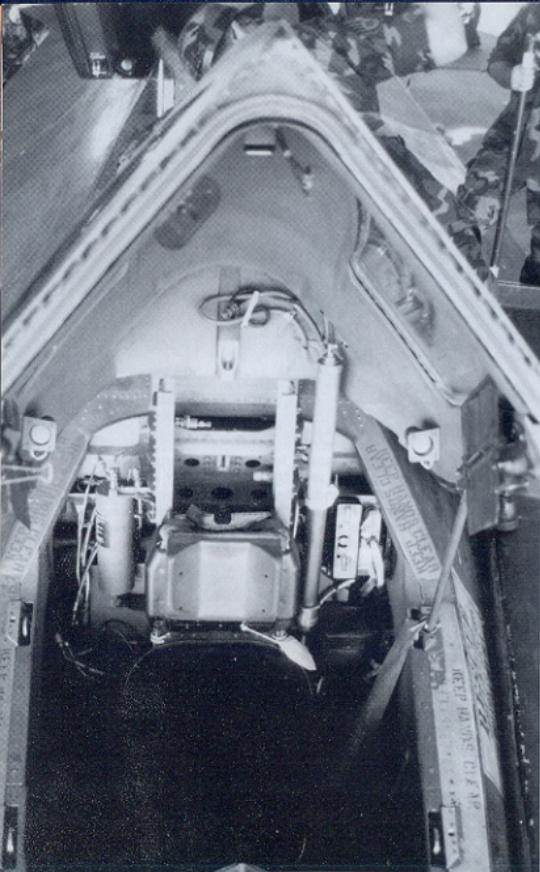
Squadron (SAS; A-12); Det 1,

9th SRW (SR-71)

Det 4, 9th SRW



A fuel dump port is fitted at the tip of the SR-71's tail cone. This vent allowed the pilot to dump excess fuel to lighten the aircraft for landing. SR-71s had longer tail cones than earlier A-12s and YF-12s, due to the added weight of equipment in the SR-71's nose. All Blackbird variants were fitted with fuel dump ports in the tail cones. (Author)

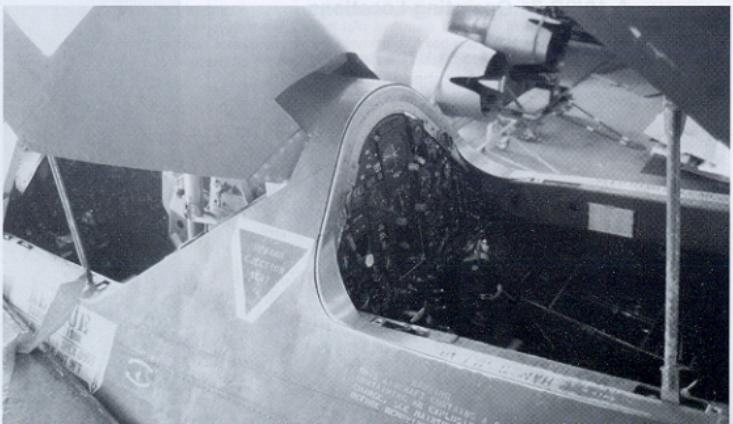


The forward canopy is opened on the first SR-71B trainer (2007/61-7956). An SR-1 (F-1) ejection seat is installed for its occupant, which was usually the student pilot. All Blackbird cockpit interiors are Dark Gull Gray (FS36231), while the canopy sills and edges are left in natural metal. (Author)



Both canopies are opened on this SR-71B sitting in its hangar. Sunshades are the black rectangular objects located just below the forward canopy side windows. These shades were used to reduce the sharp and ever present solar glare at or above 80,000 feet (24,384 m). (Author)

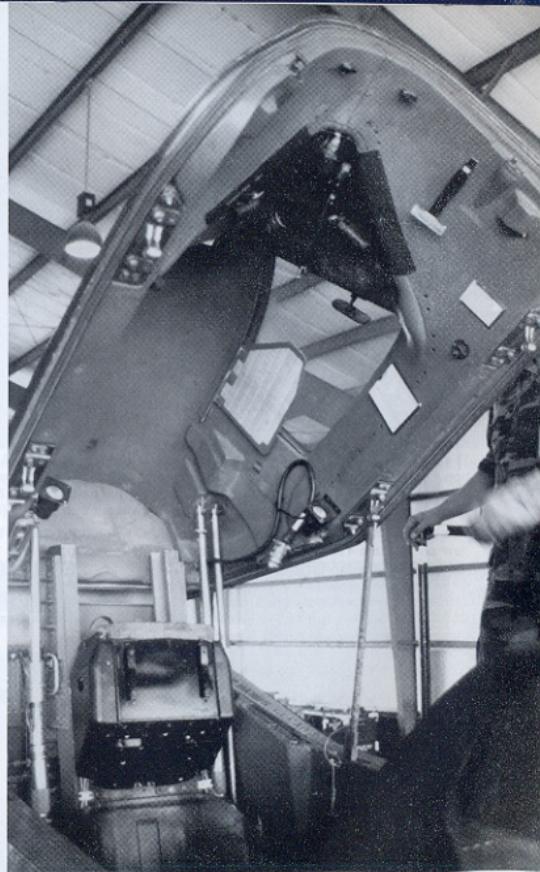
Red canopy latch bars secure each canopy in the open position. These locking bars are standard issue for all Blackbirds. The SR-71B's aft cockpit was normally occupied by the instructor pilot, who sat aft and slightly above the student pilot in the front cockpit. This version had dual flight controls and instruments, which replaced the Reconnaissance Systems Officer's (RSO's) controls and displays. (Author)





The aft canopy is fully closed on the only SR-71C (2000/61-7981). Nicknamed 'The Bastard,' this aircraft combined the aft fuselage and wings of a YF-12A with the forward fuselage of a static test aircraft. The workmanship on all of the Blackbirds is amazing. Considering that this airframe grows up to 1.92 inches (4.9 cm) in length when it is heated up during Mach 3 flight, it is still a rather tight aircraft. (Author)

Red fiberglass windshield and canopy protection covers are fitted to this SR-71B. These covers were standard on all Blackbirds and each had a protective felt pad on the contact (with the airframe) side. The last three digits of the aircraft's serial number (61-7956) are painted white on these covers. (Author)



The SR-71B's aft canopy is propped up with the canopy latch bar in the port sill. Four canopy latching mechanisms – two each port and starboard – secure the canopy to the sill. Canopy actuator rods rise from the cockpit floor and flank the ejection seat rails. (Author)



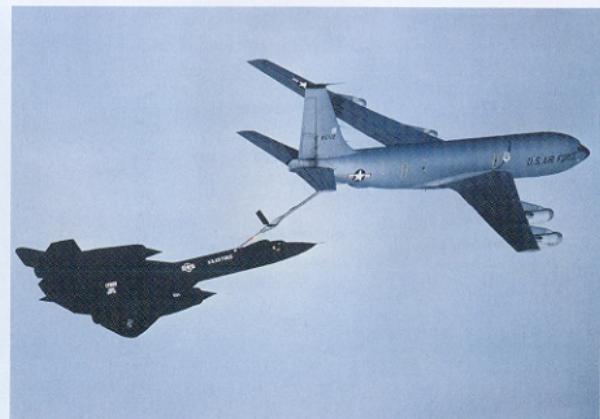
The only SR-71C (2000/61-7981) as seen at 'Last Chance' at Beale AFB, California, the home of all SR-71s before their untimely retirement. The artwork on the tail below the serial number is a chalk drawing of a can of Oly (Olympia) Beer. The SR-71C flew only 556.4 hours between 14 March 1969 and 11 April 1976, when it was retired. (Brian C. Rogers)

This is one of the few photos of the second SR-71B (2008/61-7957). This Blackbird first flew on 21 June 1965 and was the first SR-71 delivered to the new 4200th SRW (later redesignated the 9th SRW) on 7 January 1966. It was lost on approach to Beale AFB on 11 January 1968, when it suffered a double generator failure followed by a dual flameout caused by fuel cavitation. Instructor pilot Lt Col Robert Sowers and student pilot Capt David Fruehauf were forced to eject seven miles (11.3 km) from Beale and the aircraft crashed upside down in a field. (Lockheed via Tony Landis)



The only surviving SR-71B (2007/61-7956) is in the pattern of Beale AFB coming back from a training mission. The last three digits of the serial number were painted in white on the nacelles from the mid-1960s until the early 1980s. (Author's Collection)

For its 1000th flight on 15 January 1982, the remaining SR-71B (2007/61-7956) had 1000TH SORTIE painted in white on its tail. The Blackbird refuels from a KC-135Q (58-112) assigned to the 9th SRW during this mission from Beale AFB. (Author's Collection)





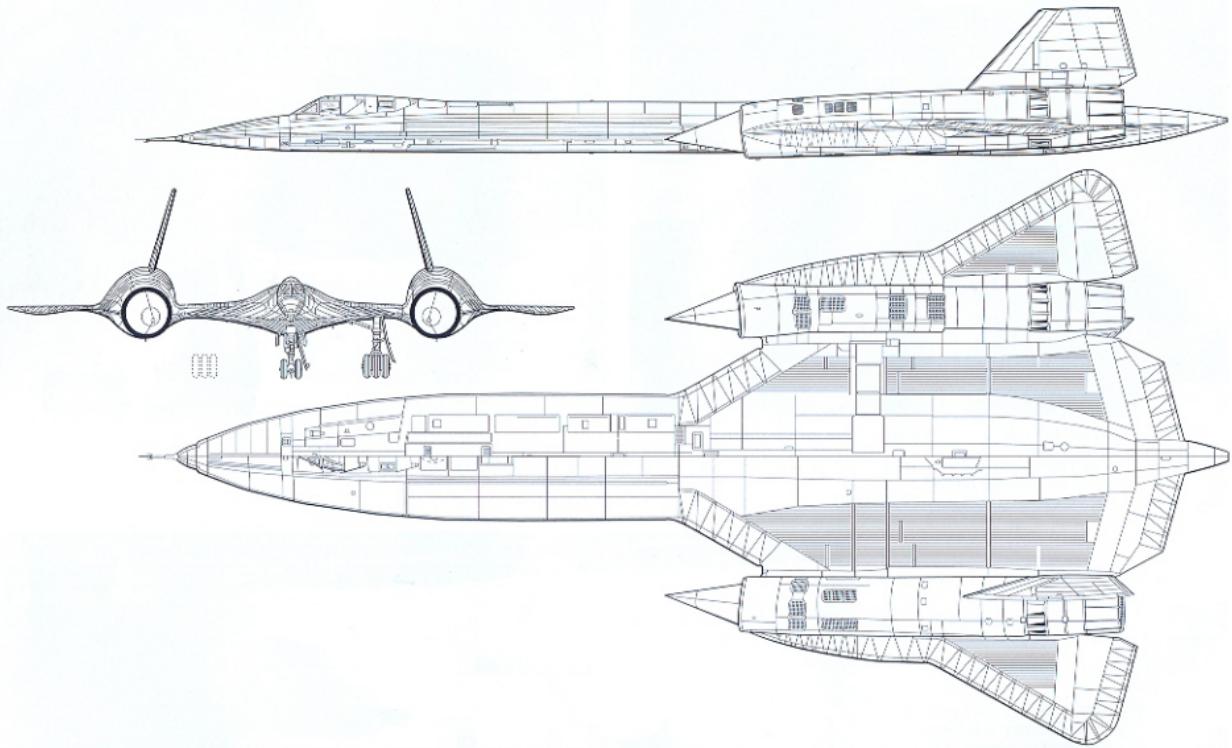
An SR-71A taxis on the Palmdale ramp. This Blackbird has the low-visibility red stenciling adopted in the early 1980s. This replaced the red, white, orange-yellow, and black stencils used with the high visibility scheme. The two fairings on the nose section chine are for Radar Homing And Warning (RHAW) system antennas, which alert the SR-71's crew to enemy radar emissions. (Lockheed via Tom Pugh)



A low-visibility marked SR-71A prepares to launch on a mission. It is equipped with a Synthetic Aperture Radar System (SARS) in the nose section. The removable nose section shows a distinct difference in finish from the remainder of the aircraft. (Lockheed via Tom Pugh)



You think you might have a fuel leak? Just look at the floor of this hangar. During peacetime operations, the SR-71 was usually fueled up with 40,000 pounds (18,144 kg) of non-flammable JP-7. All Blackbirds leak what is the equivalent of having a standard garden hose running at a good clip atop of each wing. During wartime operations, the SR-71A was typically filled with 60,000 pounds (27,216 kg) of fuel. Once the Blackbird taxied out of its hangar with this much fuel, there would be as much as three inches (7.6 cm) of fuel on the floor! From the time the engines were started until takeoff, the Blackbird will leak or consume approximately 5000 pounds (2268 kg) of JP-7. (Lockheed via Tom Pugh)



Lockheed SR-71A Blackbird Specifications

Wingspan:.....56 feet 7 inches (17.2 m)

Length:.....107 feet 5 inches (32.7 m)

Height:.....18 feet 6 inches (5.6 m)

Empty Weight:.....56,500 pounds (25,628 kg)

Maximum Weight:....145,000 pounds (65,772 kg)

Powerplant:.....Two 34,000 pound thrust Pratt & Whitney JT11D-20
(J-58) afterburning turbo-ramjet engines

Armament:.....None

Maximum Speed:....Mach 3.43 – 2340 MPH (3766 KMH) at 80,000 feet
(24,384 m)

Maximum Altitude:..89,500 feet (27,280 m) during testing; Maximum
Operational Altitude 82,000 feet (24,994 m)

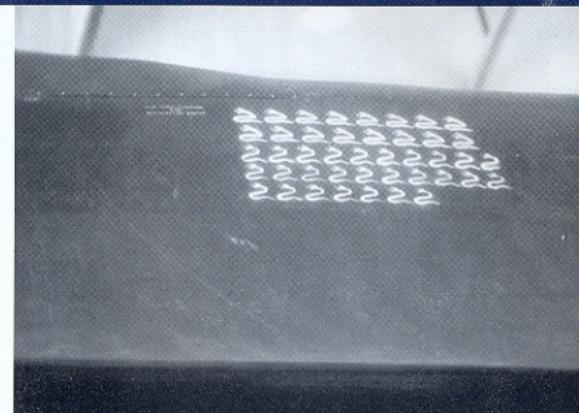
Range (Unrefueled):..3200 miles (5150 km)

Crew:.....Two



The SR-71A ICHI BAN (2025/61-7974) flies in the pattern of Beale AFB, California. While assigned to Det 1, 9th SRW at Kadena AB, it was scheduled to rotate back to Beale. Two of '974's crew chiefs, Don Peterson and Don Campbell, decided to reflect 974 as being the top habu snake and hard mission achiever over Vietnam. They painted a white habu (a Okinawan snake of the cobra family) wrapped around the red numeral one with ICHI BAN (Japanese for 'number one') under the habu. When LTC Pat Halloran (retired as a Maj General) saw the markings, he thought it was great as did the troops back at Beale. (Author's Collection)

The Lockheed Advanced Development Projects (now Lockheed Martin Skunk Works) insignia is painted on the tail of an SR-71A (2025/61-7974). This Blackbird – once named ICHI BAN – was later assigned to SR-71 flight tests at Palmdale's Air Force Plant 42, Site 2. (Author's Collection)



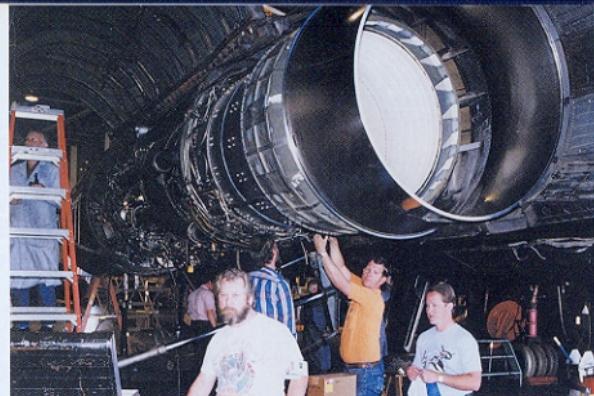
During the Vietnam War, Kadena-based SR-71s started carrying mission markings for each flight over hostile airspace. A white habu was painted for each mission on the forward fuselage, aft of the RSO's cockpit. Forty three habus are painted on ICHI BAN's fuselage late in the conflict. (Author)

This SR-71B (2007/61-7956) has 1000TH SORTIE painted in white on both vertical tails for its 1000th flight on 15 January 1982. The same art was also painted in 18 inch (45.7 cm) lettering on the inter wing undersurface. SR-71B/C aircraft had ventral fins added under both engine nacelles for increased directional stability. This was required due to the aft cockpit's raised position. (Author's Collection)



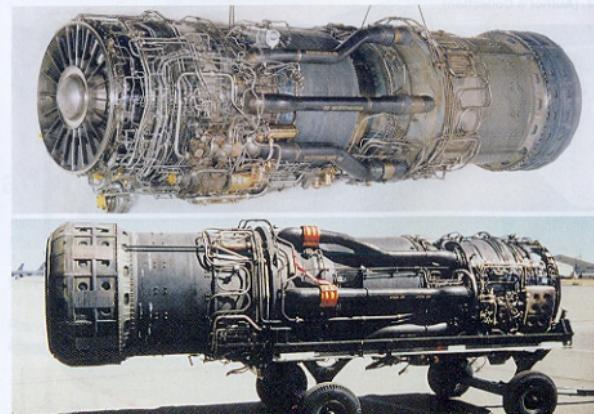


All Blackbirds featured top-hinged engine nacelles, which opened for engine installation and removal. The aft section of the inlet spike assembly is installed at the nacelle's front. Unlike most aircraft, the exhaust ejector is an integral part of the airframe. The nacelle opening fixture bar connecting the outer wing panel and the nacelle's inboard half is unique to the Blackbirds. (Lockheed via Tony Landis)



Lockheed technicians have just installed a J-58 engine into an SR-71's port nacelle. They are reconnecting all the linkages, fuel lines, and nacelle hardware. Civilian technical representatives provided invaluable experience to the USAF maintenance personnel, due to the Blackbird's complex systems and the low manpower retention of USAF personnel. (Lockheed via Tony Landis)

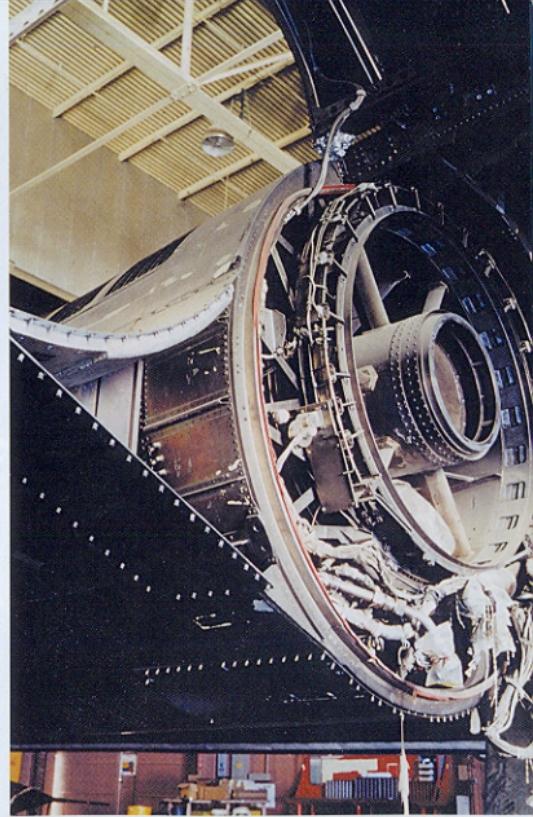
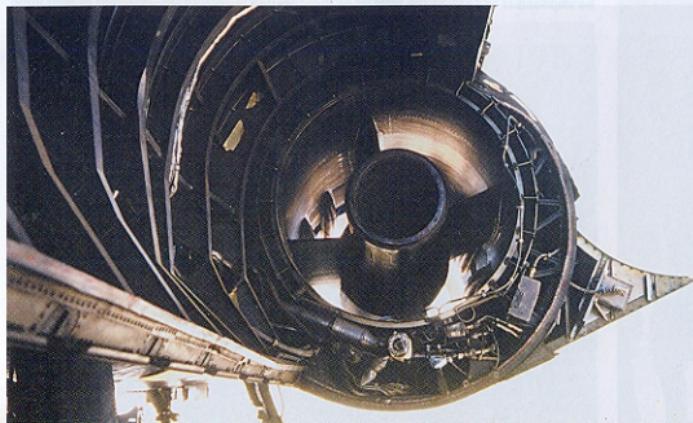
One Pratt & Whitney YJ-58 service test is slung in the upper photo and a model K standard production J-58 is placed on a heavy-duty engine stand in the lower photo. The JT11D-20 (military designation J-58) measured 20 feet (6.1 m) long, 4.5 feet (1.4 m) in diameter, and 6500 pounds (2948 kg) in weight. Early J-58s produced 30,000 pounds of thrust, while later versions were rated at 34,000 pounds. It operated in continuous afterburning during cruise flight. (Both: Author's Collection)



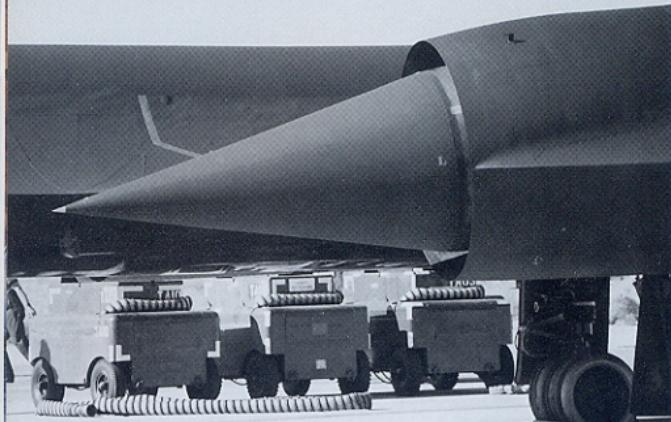


The port J-58 has been removed from this SR-71 during overhaul. Blackbirds were extensively inspected after each flight, with major airframe and engine inspections conducted every 200 flight hours. Engine changes usually took at least eight hours per engine. The exhaust ejector ring is located near the nacelle's rear section. Bypass doors are placed between the ejector ring and the exhaust ejector flaps. A white ground tracking stripe is painted along this SR-71A's centerline for a series of world altitude and speed records set in July of 1976. (Author)

The starboard outer wing and nacelle panel is removed from this SR-71. The inlet spike assembly is attached to the inlet. SR-71 inlets provided over 80 percent of the aircraft's total thrust while cruising at Mach 3.2. (Author)

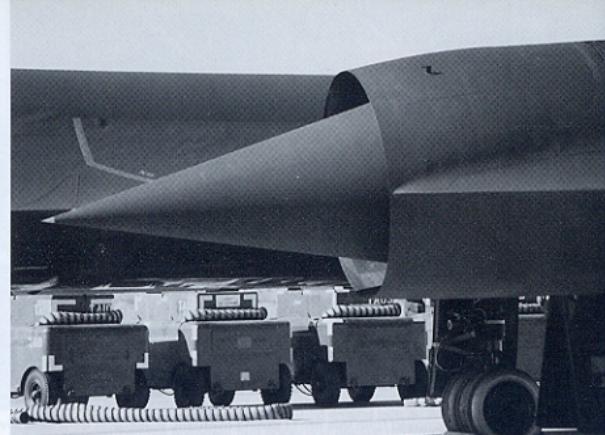


The face of the Blackbird's Pratt & Whitney J-58 mates up to the inlet's aft end. There are dozens of connections, lines, and linkage that must be reconnected once each J-58 is reinstalled. The ring of what looks like the points of a clock are pressure sensors, which send signals to the inlet control computer. This device controls the inlet bleed bypass gates that relieve air pressure and the inlet spike that prevents supersonic air from entering the engine. (Author)



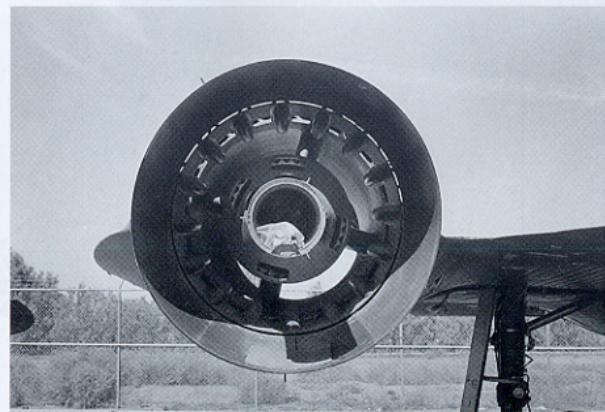
This Blackbird's port inlet cone is in the full forward position. The position is maintained from engine stop until the SR-71 accelerates past Mach 1.2. This is the speed when the inlet begins moving aft to control and position the airflow coming into the engine. (Lockheed via Tony Landis)

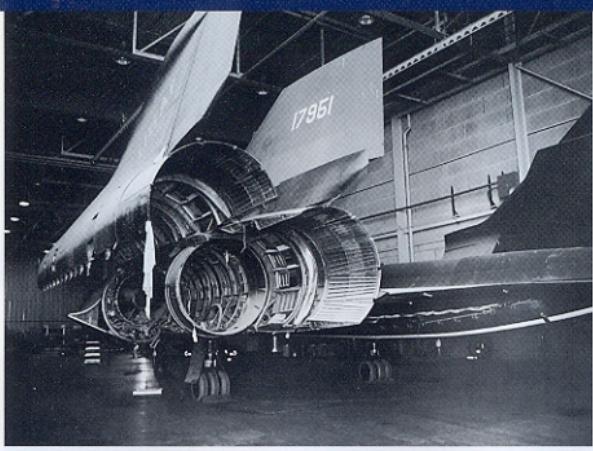
This inlet cone is partially retracted during a ground test. At Mach 3.2, the Blackbird's two inlets draw in approximately four million cubic feet (113,268 m³) of extremely thin air per second. An automatic intake control system air data probe is mounted on the nacelle, just aft of the intake lip. (Lockheed via Tony Landis)



The inlet spike moves aft during a functional check of the inlet control system. SR-71 pilots were able to manually select the spike position from inside the cockpit. The inlet spike fully retracted 26 inches (66 cm) at the Blackbird's cruising speed of Mach 3.2. (Lockheed via Tony Landis)

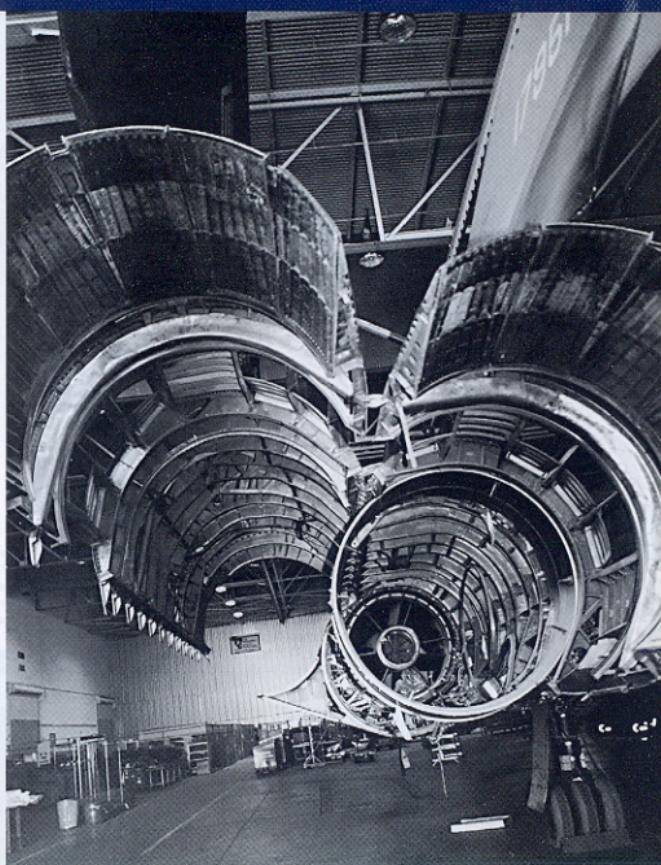
The inlet spike has been removed from the starboard inlet. The 16 canoe-shaped devices in the inlet are the 'Mice' installed to smooth out the inlet airflow and to restrict the inlet opening size. Lockheed's Kelly Johnson knew while working on the inlet design that he could always reduce the inlet opening by using restrictors such as the 'Mice,' but it would be impossible to enlarge the inlet once flight testing began. (Author)





The port J-58 engine has been removed from this SR-71A (2002/61-7951). USAF in Flat Insignia White (FS37875) is painted on the outboard wing undersurface. Wear marks in and around the exhaust ejector testify to the extreme temperatures this area was exposed to during Mach 3 flight. (Tony Landis)

Flame holders – four concentric circles – mark the afterburner section's front on a J-58 engine installed on a SR-71. JP-7 fuel sprayed into these flame holders in afterburner mode increased engine thrust. The fuel's temperature at this point was 700° Fahrenheit (371° Celsius). The ceramic afterburner lining rapidly cooled after withstanding tremendous heat in constant afterburner use. Free-floating blow-in doors along the aft nacelle's outer surface are open. (Author)



The port J-58 engine is removed from an SR-71A at Lockheed's Blackbird overhaul facility in Palmdale, California. Twelve prongs located along the open cowling edge fit into slots located in the fixed cowling section. Engine fuel hoses hang down from inside the nacelle. The exhaust ejector flaps are in the open position normally found at speeds from Mach 1.5 to Mach 3.2. (Tony Landis)



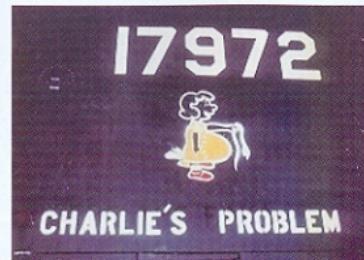
During the height of the Vietnam War, SR-71 overflights were a daily occurrence. Two Blackbirds (2018/61-7967, left, and 2011/61-7960) prepare to launch for a mission over North Vietnam. These aircraft were assigned to Detachment One (Det 1), 9th Strategic Reconnaissance Wing (SRW), which was located at Kadena AB, Okinawa. SR-71s began

deploying to Kadena in March of 1968, replacing the CIA's A-12s. SR-71A '960 completed 342 combat missions – the most for any Blackbird – during its service career. It is now displayed at the Castle AFB Museum in Merced, California. (Matt Moran)

CHARLIE'S PROBLEM (2023/61-7972) was one of the more hilarious examples of tail artwork carried on the SR-71. The image is hard to see, but it shows a side profile of Peanuts character Lucy pregnant! This SR-71A set a trans-Atlantic speed record on 1 September 1974, when it flew 3490 miles (5616 km) from New York to London in 1 hour 54 minutes 56.4 seconds. The average speed was 1807 MPH (2908 kmh). Twelve days later, it covered the 5645 miles (9084.5 km) from London to Los Angeles in a record 3 hours 47 minutes 35.8 seconds. This SR-71 averaged 1436 MPH (2311 kmh) for the westward trip. The same Blackbird set a trans-continental speed record on its last flight from Los Angeles to Washington, DC on 6 March 1990. It covered the 2086 mile (3357 km) distance in 1 hour 7 minutes 53.7 seconds, with an average speed of 2145 MPH (3452 kmh). SR-71A '972 is on display at the National Air and Space Museum's Stephen F. Udvar-Hazy Center at Washington Dulles IAP. (Dave Menard Collection)



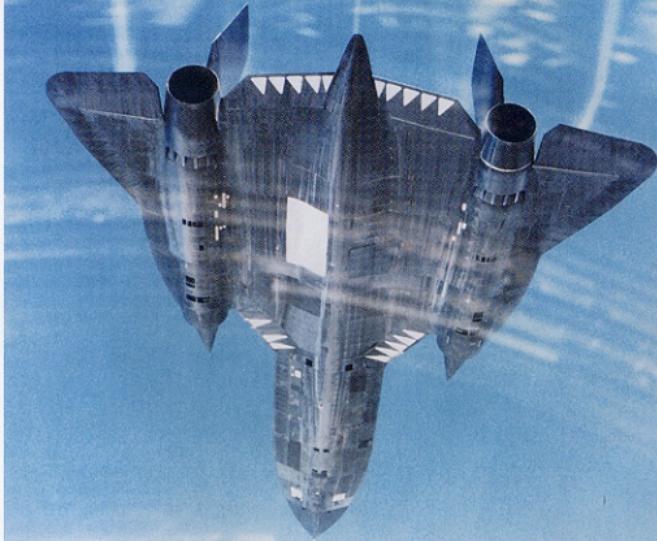
CHARLIE'S PROBLEM is white under a pregnant Lucy on the tail of this SR-71A (61-7972). Blackbird tail art was usually removed when the aircraft returned from Kadena or Mildenhall to Beale. (Author's Collection)



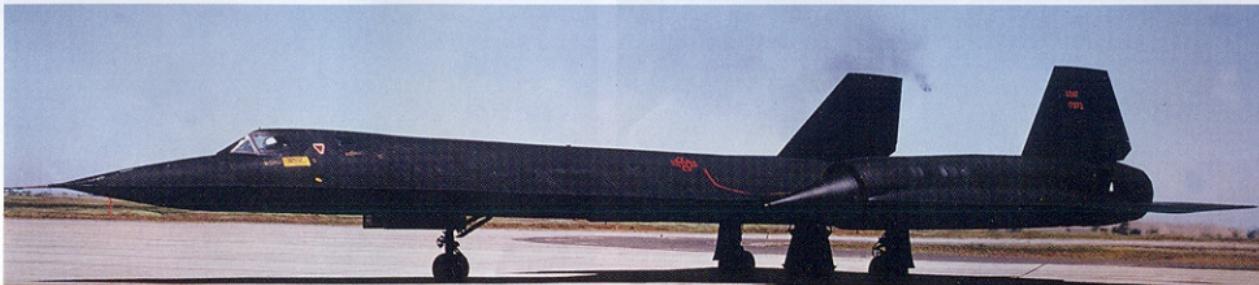


During the early 1980s, the SR-71 fleet began transitioning to low visible markings. This Blackbird (2022/61-7971) has the first phase, in which the nacelle buzz numbers were removed. All other markings were standard, including Flat Insignia White U.S. AIR FORCE fuselage titles and USAF upper right and lower left wing markings. (Author's Collection)

(Below) The next phase for the SR-71 low-visibility program was the short lived Flat Insignia Red (FS31136) outline national insignia on the fuselage and wing locations, where the full-color insignia were previously used. The tail markings were also changed to have USAF above the five-digit tail number, both in 6-inch (15.2 cm) tall Flat Insignia Red lettering. This SR-71A (2024/61-7973) was a one-off version of this scheme and was not continued on other Blackbirds. The new red insignia looked too much like the red star painted on Soviet aircraft. (Author)



(Above) Some new type radar absorbent panels (in white) appear on the undersurface of this SR-71A. This test flight was done to flight qualify these panels for use on operational Blackbirds. Radar Absorbent Materials (RAMs) along the Blackbird's leading and trailing edges greatly contributed to the aircraft's stealthy qualities. (Author)





The first man to break the sound barrier, Brigadier General Chuck Yeager, is assisted out of the 9th SRW's SR-71B (2007/61-7956). This occurred after his first Mach 3+ flight from Beale AFB on 5 August 1983. Then-Capt Yeager flew supersonic in the Bell X-1 on 14 October 1947. (Ron Bullard)



This must have been 'Prince for a Day' at Royal Air Force (RAF) Mildenhall in the United Kingdom. No, I must be mistaken, it really is a Prince! In a gesture of mutual friendship between the USAF and the British Royal family, His Royal Highness, Prince Charles, was invited to receive a briefing on the SR-71's capability. He also had the opportunity to see first hand the drivers' seat of the world's fastest operational aircraft. (Lockheed via Tom Pugh)

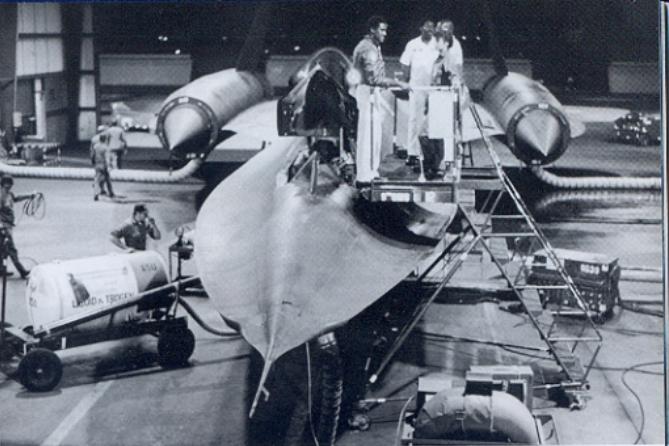
LTC Ed Yielding (left) shakes the hand of his RSO, LTC Joe Vida, after landing their SR-71A (61-7972) at Washington Dulles IAP on 6 March 1990. The retirement flight for this Blackbird set a new trans-continental speed record from Los Angeles, California to Washington, DC. This coast-to-coast flight took 1 hour 7 minutes 53.7 seconds. (Tony Landis)





Clarence L. 'Kelly' Johnson – the man that gave birth to the world famous Lockheed Skunk Works and its fantastic flying machines – receives his one and only Blackbird ride. Kelly was in the backseat of the A-12B trainer, the 'Titanium Goose,' which was flown by the Skunk Works' chief test pilot, Lou Schalk, from 'Area 51' in early 1963. (Author's Collection)

An Air Force technician pumps liquid nitrogen into the two 28 gallon (106 l) liquid nitrogen tanks located in the SR-71's nose wheel well. Some SR-71s were retrofitted with an additional 13.2 gallon (50 l) tank, which allowed for longer missions. This tank is also called a dewar. (Tony Landis)

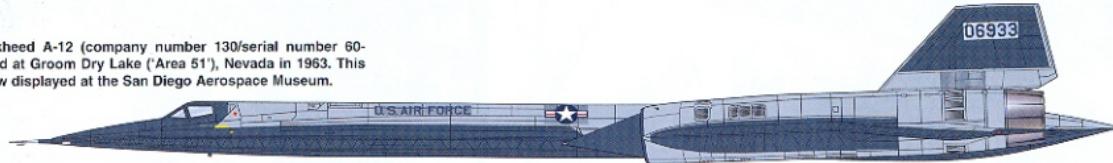


Physiological Support Division (PSD) crew from the 9th SRW awaits the SR-71 crew to arrive for a late evening launch at Beale AFB, California. PSD personnel maintained the pressurized flight suits, prepared the Blackbird crews for their flights, strapped them into the aircraft, and helped them out after the mission. (Author's Collection)

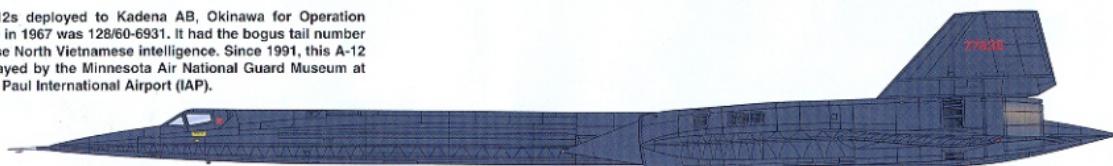
A ground crewman loads liquid nitrogen from a trailer off the SR-71's starboard nose. Liquid nitrogen was used to inert both the fuel and hydraulic systems. This kept the fuel tanks pressurized and sealed both systems from the problems associated with air contamination. (Tony Landis)



The tenth Lockheed A-12 (company number 130/serial number 60-6933) was based at Groom Dry Lake ('Area 51'), Nevada in 1963. This Blackbird is now displayed at the San Diego Aerospace Museum.



One of the A-12s deployed to Kadena AB, Okinawa for Operation BLACK SHIELD in 1967 was 128/60-6931. It had the bogus tail number 77835 to confuse North Vietnamese intelligence. Since 1991, this A-12 has been displayed by the Minnesota Air National Guard Museum at Minneapolis/St. Paul International Airport (IAP).



Operational D-21



This was the first of two purposely-built M-21 (134/60-6940) 'Motherships' for the D-21 drone program (TAGBOARD). The M/21/D-21 combination was based at 'Area 51' during the 1960s and is now displayed at the Museum of Flight in Seattle, Washington.



The three YF-12As – including the third aircraft (FX-936; 1003/60-6936) – originally were natural metal with Flat Black radomes, intake spikes, and airframe edges. This aircraft was based at Groom Lake from 1963.



The second YF-12A (FX-935; 1002/60-6935) was repainted overall Flat Black for Advanced Manned Interceptor tests at Edwards AFB, California in the mid-1960s. The Air Defense Command insignia is painted on the port vertical tail, while the Air Force Systems Command badge appeared on the starboard vertical tail.



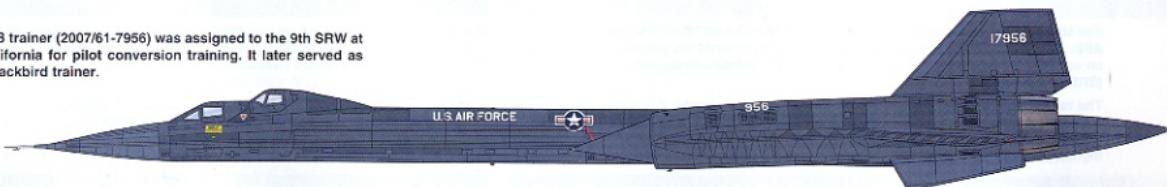
This SR-71A (2027/61-7976) flew the type's first operational mission over North Vietnam from Kadena AB on 9 March 1968. It is now displayed at the USAF Museum at Wright-Patterson AFB near Dayton, Ohio.



ICHI BAN (Japanese for 'number one') was the name given this SR-71A (2025/61-7974), assigned to Det 1, 9th SRW, Kadena AB during the Vietnam War. Okinawans nicknamed the SR-71 the "Habu," after a poisonous snake native to their island. Mission tallies in the form of white habus were painted on '974's forward fuselage.



The first SR-71B trainer (2007/61-7956) was assigned to the 9th SRW at Beale AFB, California for pilot conversion training. It later served as NASA's sole Blackbird trainer.



On its final flight on 6 March 1990, this SR-71A (2023/61-7972) flew from Los Angeles to Washington, DC in a record time of 1 hour 7 minutes 53.7 seconds. A low-visibility Air Force Logistics Command insignia and the Lockheed Skunk Works emblem are painted on the tail. The Blackbird landed at Washington Dulles IAP, where it is displayed at the National Air and Space Museum's new Stephen F. Udvar-Hazy Center.



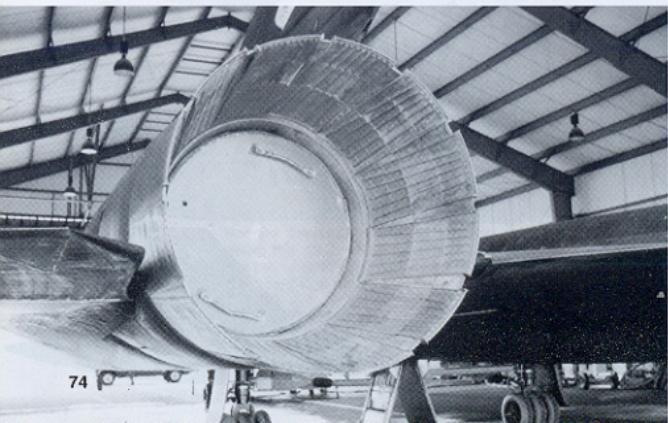
The first SR-71A (BB; 2022/61-7971) reactivated by the USAF flew from Edwards AFB on 26 April 1995. A low-visibility Air Combat Command insignia was painted above the BB tailcode for the 9th Reconnaissance Wing (formerly SRW) at Beale.





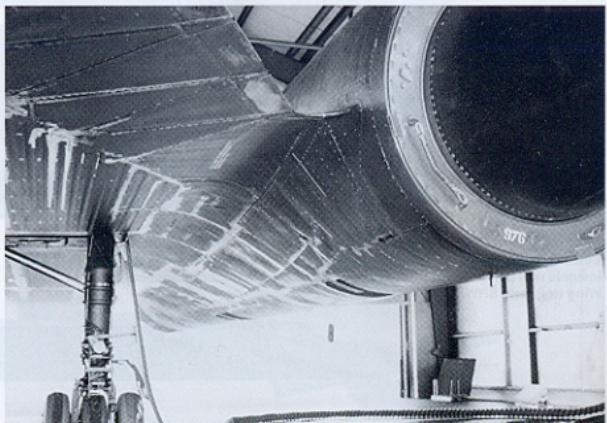
The 9th SRW insignia is painted on the tail of an SR-71A (2027/61-7976) sheltered at Beale AFB. A large number of Blackbirds displayed this insignia as the program was coming to an end. SR-71s equipped the Wing's 1st and 99th Strategic Reconnaissance Squadrons (SRSs). (Author)

The red exhaust ejector plug is over four feet (1.2 m) in diameter. It is held in place using a force fit and a rubber hose-like gasket that runs along the plug's outer edge. This keeps Foreign Object Damage (FOD) out of the aft nacelles while the SR-71 is between flights. (Author)



Red chine protective coverings are installed just below the two cockpits of this SR-71A. This occurred during the filming of a documentary for the US Air Force at Beale AFB in the late 1970s or early 1980s. (Author)

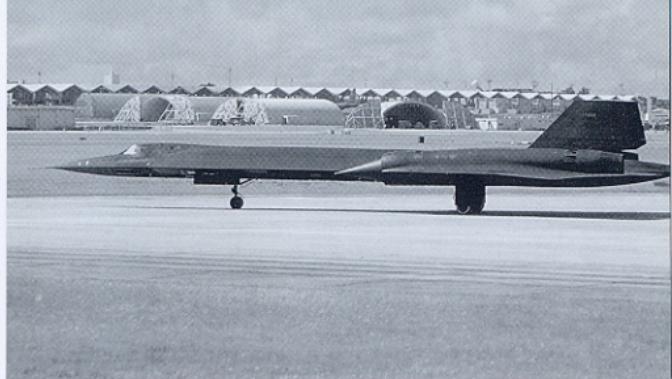
A considerable amount of JP-7 leaking from the SR-71A streaks the port wing undersurfaces and collects on the hangar floor. The red inlet cover has the last three digits of the aircraft's serial number (976) stenciled in white. (Author)





The last SR-71A built (2032/61-7980) heads out of 'T' hangar, 'Area 19' in the spring of 1971. ('Area 19' – immediately southwest of Groom Dry Lake – is part of the Nevada Test Site for nuclear weapons testing.) The CIA built and paid for these hangars for the BLACK SHIELD A-12s that flew out of Kadena AB, Okinawa from May of 1967 through June of 1968. (Ron Bullard)

An SR-71A (2018/61-7967) lifts off from the Kadena runway in November of 1979. The red 1 below the tail number indicated Det 1, 9th SRW. This is one of only four SR-71s that were authorized to wear tail art; the others were 974 ICHI BAN, 978 RAPID RABBIT, and 968 Dolby. The nose landing gear is 80 percent retracted and the main gear doors are almost closed. All Blackbirds had forward retracting nose gears. (Mike Grove)



An SR-71A (2009/61-7958) heads for the 'hammerhead' at Kadena AB for launch in September of 1985. The Blackbird is painted with the low visibility markings applied to the entire SR-71 fleet in the early 1980s. (Author's Collection)

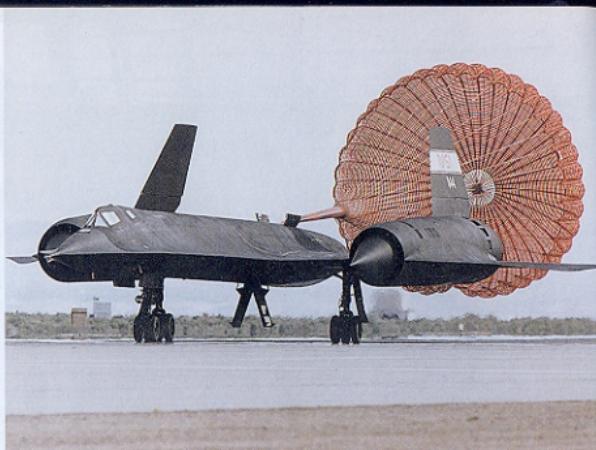
A USAF RF-4C Phantom II took an overhead view of an SR-71A taxiing at Kadena AB in January of 1983. Red walkway lines are painted along the inboard wing surfaces. The brake chute doors are opened on the upper aft fuselage. (Via Tony Landis)





An SR-71A (2012/61-7961) flies just over the clouds in this often seen, yet beautiful view. This Blackbird logged 1601 flight hours through its last flight on 27 February 1977. The aircraft is now displayed at the Kansas Cosmosphere & Space Center in Hutchinson, Kansas. (Author's Collection)

Lockheed Martin engineers mate the Aero Spike engine for the firm's X-33 advanced technology demonstrator onto an SR-71's aft fuselage. It was planned for the Blackbird to fly to Mach 3, light the liquid hydrogen-fueled engine, and see what happened. Both Lockheed Martin and NASA then reconsidered carrying a large amount of liquid hydrogen on board a hot aircraft. Additionally, the Aero Spike caused so much drag that they had a difficult time getting above Mach 1. (Author's Collection)



NASA's sole remaining SR-71A (844; 2031/61-7980) touches down with the help of its 40 foot (12.2 m) diameter red-orange Nomex ribbon chute. The Blackbird requires this chute since its brakes are inadequate to stop the aircraft, which weighs approximately 120,000 pounds (54,432 kg) on landing. (NASA via Tony Landis)

One SR-71A and sections of several other Blackbirds are stored in a hangar at Site 2, Air Force Plant 42 in Palmdale. The red line on the inner wing upper surface warned personnel not to step beyond that area. SR-71 overhauls were performed at Palmdale and several remaining aircraft are stored there. (Author's Collection)





The sole SR-71A/BT 'Big Tail' (2010/61-7959) refuels from a Beale-assigned KC-135Q. (58-0095). The eight-foot (2.4 m) tail cone extension housed the Optical Bar Camera (OBC) system. This Blackbird was retired when 'Big Tail' was cancelled in 1976 and is now displayed at the Air Force Armament Museum at Eglin AFB, Florida. (Lockheed via Tony Landis)

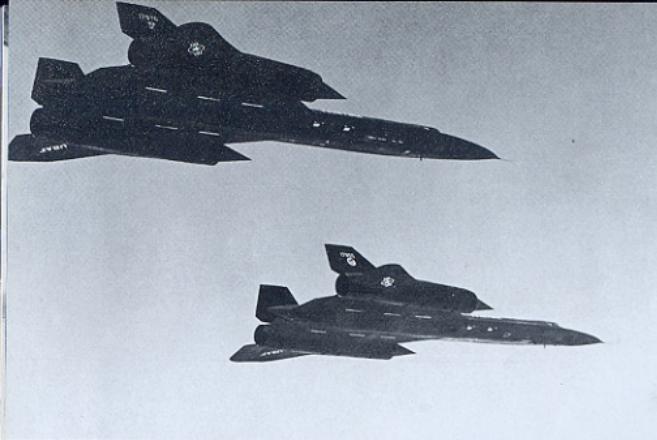
The sole remaining SR-71B (NASA 831; 2007/61-7956) lights its twin afterburners during lift off from Edwards AFB. The end of all Air Force SR-71 operations and no current funding for NASA flights has resulted in both remaining NASA assigned SR-71s being placed in long-term storage. NASA has asked the Air Force to turn the remaining SR-71 assets over to the Air Force Museum for future disposition. (NASA via Tony Landis)



Does the verse "*Come on baby light my fire*" ring a bell? This Mildenhall-assigned SR-71A (2011/61-7960) lights raw fuel in a spectacular flyby on 24 May 1986. The crowd attending the RAF Fairfield, England air show was by no means disappointed. This Blackbird was last flown on 27 February 1990, when it was delivered to the museum at the former Castle AFB in California. (George W. Pennick)

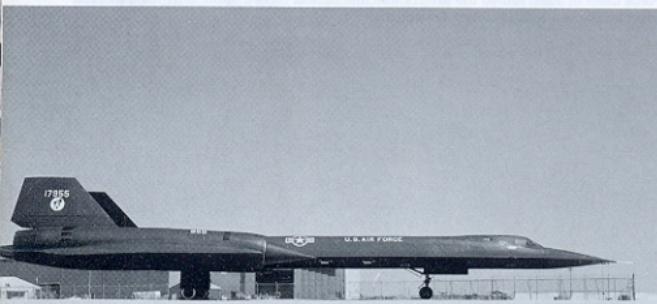
General John Chain, Commander-in-Chief Strategic Air Command (center) is flanked by Ben R. Rich (left), President of the Lockheed Skunk Works, and Colonel James Savarda, Commander of the 9th SRW. They stand near an SR-71A at the type's retirement ceremony at Beale AFB on 26 January 1990. It is believed the reason General Larry Welch, Air Force Chief of Staff, retired the SR-71s was that he was turned down to fly the Blackbird when he was a major. (Author's Collection)





Two SR-71As (2027/61-7976, left, and 2006/61-7955) fly in formation. These Blackbirds operated from Lockheed's flight-test facility at Site 2 in Palmdale. The two aircraft have the Skunk Works skunk painted on their tails below the number. (Author's Collection)

This flight test dedicated SR-71A (2006/61-7955) displays the Lockheed Skunk Works emblem under the standard Air Force serial number. The aircraft flew 1993.7 hours during a stellar flight test career at Site 2, which ended with its final flight on 24 January 1985. This SR-71A was later moved overland from Palmdale to Edwards AFB, where it is now displayed at the Air Force Flight Test Center Museum. (Author's Collection)



78



SR-71A RAPID RABBIT (2029/61-7978) flies over Mount Shasta, California, approximately 100 miles (161 km) north of Beale AFB, during a normal training flight. The Playboy bunny head is painted between the tail number and the name. Major Denny Bush (Pilot) and Major Jim Fagg (RSO) lost this Blackbird while attempting a severe crosswind landing at Kadena AB during a typhoon on 20 July 1972. (Author's Collection)

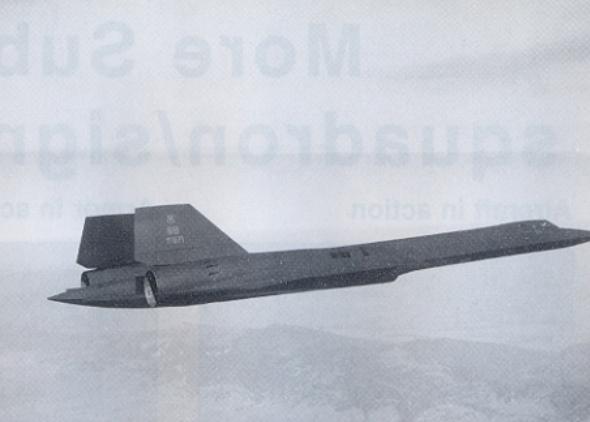
An SR-71A (2027/61-7976) flying over the Northern California countryside has the 9th SRW's full-color insignia painted on its tail. This was the first SR-71 to fly a combat mission over Vietnam on 21 March 1968. Its crew was Major Jerry O'Malley (Pilot) and Captain Ed Payne (RSO). On 20 April 1985, then-General O'Malley – Commander-in-Chief of Tactical Air Command – lost his life and that of his wife and crew in a landing accident. The CT-39A he was flying crashed at Scranton/Wilkes-Barre Regional Airport in north-eastern Pennsylvania. (Author's Collection)





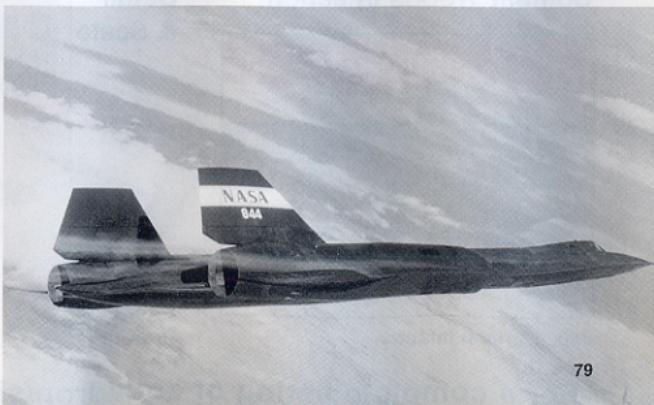
The 'Big Tail' SR-71A/BT (2010/61-7959) banks over Rogers Dry Lake, which is in the center of Edwards AFB. The extended tail cone moved +/-8.5° for take off and landing ground clearance and for in-flight trim. Rogers Dry Lake is an alternate landing site for NASA's Space Shuttle. (US Air Force via Tony Landis)

Two NASA 'black beauties' fly in formation over the Southern California landscape. The General Dynamics F-16XL (NASA 849) has a great black, white, and yellow paint job and has the new/old style NASA logo on its tail. In contrast, the SR-71 (NASA 844; 61-7980) still has the now-banned NASA 'worm' logo in red on a white tail band. (Author's Collection)



The two reactivated Air Force SR-71As – 61-7971 here, and 61-7967 – briefly had BB tail codes above Air Combat Command (ACC)-style tail numbers in 1995. These markings and the ACC insignia above BB were Flat Insignia Red. BB either stands for Black Bird or Beale's Blackbird, take your pick. (US Air Force via Tom Pugh)

One of NASA's two SR-71s (NASA 844) flies at medium altitude over Southern California. This and NASA's other Blackbird (NASA 832; 61-7971) now have the new politically correct NASA logo painted in gloss red on a gloss white tailband, which has parallel gloss white pinstripes. (NASA via Tony Landis)



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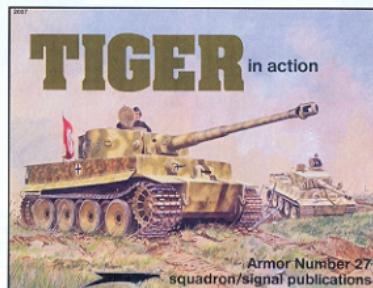
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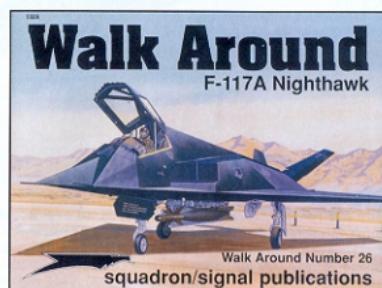
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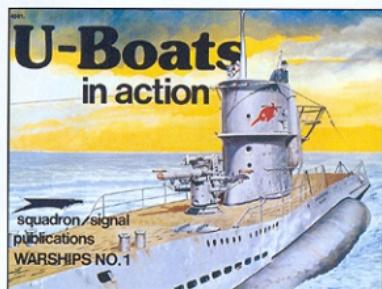
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